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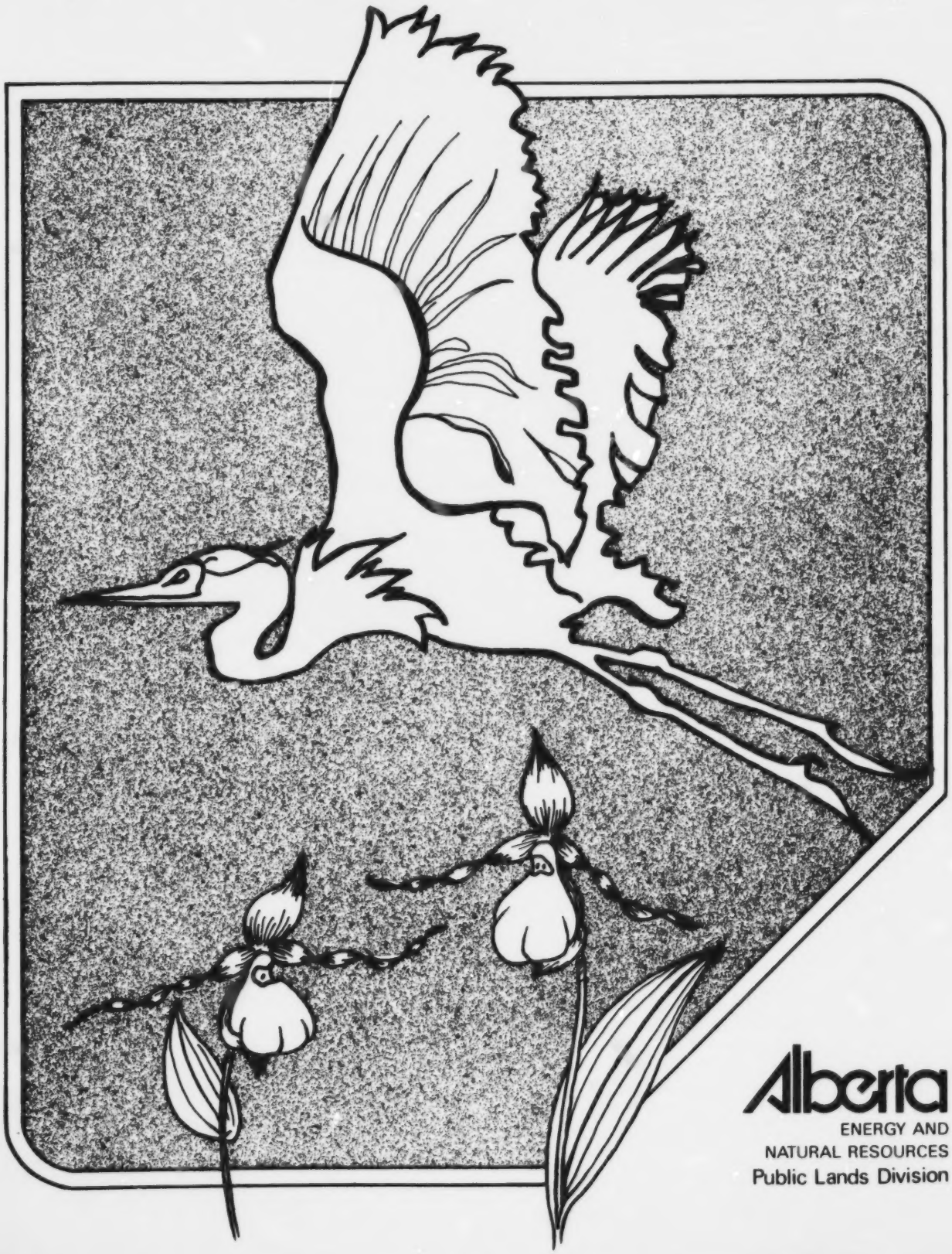
VEGETATION AND FLORA OF THE ALPINE AND UPPER SUBALPINE ZONES - WHITEGOAT AND SIFFLEUR WILDERNESS AREAS



Alberta
ENERGY AND
NATURAL RESOURCES
Public Lands Division

VEGETATION AND FLORA OF THE ALPINE AND UPPER SUBALPINE ZONES - WHITE GOAT AND SIFFLEUR WILDERNESS AREAS -

Peter Lee
Lorna Allen
Pat McIsaac

A Report Prepared for the
Natural Areas Program
Alberta Energy and Natural Resources

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GLOSSARY

alpine - those vegetated areas above treeline

biogeographic zone -
refers to one of the natural zones of Alberta as mapped on "Natural Regions of Alberta", Alberta Recreation and Parks, 1978

community type -
group of similar plant assemblages which repeatedly occur

distributionally important -
refers to species generally found elsewhere in the province

Ecological Reserve -
an area of land conserved in an undisturbed state primarily for preservation and scientific purposes

flora - list of plant species occurring in an area

non-vascular flora -
lichens, mosses, liverworts

rare - species is known from 1-5 localities in the province

uncommon - species is known from 6-10 localities in the province

understory vegetation -
that combination of plants under a canopy of trees

upper subalpine -
those areas below treeline and above 1,920m (6,300 feet)

vascular flora -
those plants having xylem and phloem for the transportation of water and nutrients and for mechanical support

vegetation - group of plant community types which characterize an area

vegetation physiognomic groups -
group of plant community types of similar external appearance

SUMMARY

This report was prepared to:

1. document field studies as consistent with Natural Areas Program policy.
2. assist in the comparison and evaluation of sites for possible inclusion in the Ecological Reserves program.

The White Goat and Siffleur Wilderness Areas were chosen for field investigation because the Natural Areas Program required immediate information on these areas for comparison with other similar sites.

Field work was conducted during seven days in 1981 using a rapid reconnaissance technique.

The vegetation was classified into 32 plant community types within five physiognomic groups.

Most areas above treeline are occupied by unvegetated bedrock exposure and talus and rockslide deposits. Those vegetated areas above treeline, or alpine, were classified into 13 plant community types. The two most prevalent types in the alpine are the yellow heather/willow - everlasting and the white dryad - willow types.

Those areas below treeline, or subalpine, were classified into 19 plant community types. Non-forested subalpine areas were dominated by willow and birch community types on moist sites and willow, grass and juniper types of drier sites. Subalpine forests were dominated by subalpine fir - spruce and lodgepole pine types.

Three hundred and twenty-nine plant species were recorded from this and previous studies. Of these, 21 are considered rare in the province, 22 are uncommon and 29 are distributionally important. One species, a mustard, has not been recorded previously for the province.

The vegetation and flora of the White Goat and Siffleur Wilderness Areas is briefly compared with other protected sites in Alberta. They have close affinities with much of eastern Banff and Jasper National Parks. There are some differences with other mountain parks and candidate Ecological Reserves.

An assessment of the entire alpine and subalpine zones in Alberta for Ecological Reserve purposes requires additional field work, especially in the are between the Ram River and the Ghost River Wilderness Area, Kakwa area and Willmore Wilderness Area and an area between Crowsnest Pass and Waterton National Park.

ACKNOWLEDGEMENTS

Fieldwork was assisted by Dr. P. L. Achuff, B. Hamrell, L. Rivard and D. MacIsaac. Dr. D. G. Horton identified or verified bryophyte collections. C. Tannis and J. Hollingshead identified or verified much of the vasular plant collection. Dr. J. G. Packer verified many of the rare and unusual vascular plants. Dr. G. A. Mulligan verified the species within the Draba genus. Dr. G. Argus verified the species within the Salix genus. S. Loomis, W. Nordstrom and C. Wallis reviewed portions of the text.

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INTRODUCTION

The Natural Areas Program of Alberta's Department of Energy and Natural Resources has the mandate to systematically assess and recommend for designation and conservation as Ecological Reserves, various ecosystem types in the province which represent typical as well as unusual and special features.

To properly compare various areas and avoid duplication, information is required on other similar protected and unprotected types. The White Goat and Siffleur Wilderness Areas are two areas within the alpine and subalpine biogeographic zones that are protected by provincial legislation. They are isolated in terms of road access and little work has been done on their vegetation and flora.

This present study was based on fieldwork conducted by the Natural Areas Program staff in the summer of 1981 to provide information on the White Goat and Siffleur Wilderness Areas. The information will assist in the comparison of alpine and upper subalpine areas in the Alberta Rocky Mountains.

Only areas above 1,920m (6,300 feet) in elevation were investigated. It is recognized that this study must be regarded as preliminary in nature and that further vegetation types will be recognized and additional flora reported as more intensive future work is conducted. The preparation of this report at this time, however, is consistent with the Natural Areas Program policy of documentation of field studies.

METHODS

Fieldwork was conducted by the Natural Areas Program staff on 29 July to 1 August in the White Goat and 2 to 4 August in the Siffleur Wilderness Areas.

A rapid reconnaissance technique was used to describe plant communities. Investigators selected homogeneous communities from airphotos (1:40,000 and 1:21,120). All species present in the stand were recorded and a cover class value assigned to each using an eight-point scale: +, 1%; 1, 1-5%; 2, 6-15%; 3, 16-25%; 4, 26-50%; 5, 51-75%; 6, 76-95%; 7, 96-100%. In the alpine and upper subalpine areas, 103 stands above 1,920m (6,300 feet) in elevation were sampled and about an additional 75 were recorded to dominants.

The communities were classified into physiognomic classes per Achuff and Corns (1981): Closed Forest, Open Forest, Shrub, Low Shrub-Herb and Herb-Dwarf Shrub. The community types described in the report were tabulated with the assistance of and compared to the vegetation types reported for Banff/Jasper (Achuff and Corns 1981) (since that report contains a comprehensive analysis of vegetation and flora over a very extensive area in the Alberta Rocky Mountains).

Additionally, two transects (totalling 7.5 km) were run in an alpine basin in upper McDonald Creek, White Goat Wilderness. Communities, slope, aspect and areal extent were recorded.

Plant voucher specimens were collected and were deposited in the herbaria of the University of Alberta (ALTA), Provincial Museum of Alberta (PMAE), Agriculture Canada (DAO) and the National Museum of Canada (CAN). Nomenclature for vascular plants follows primarily Moss (1959) and Hitchcock and Cronquist (1973), except for species within the Draba genus which follows Mulligan (1976). Nomenclature for mosses follows Lawton (1971), for liverworts follows Conrad (1979) and for lichens follows Hale (1969).

STUDY AREA

LOCATION

There are three established Wilderness Areas in Alberta; Siffleur, White Goat and Ghost River. They occupy nearly 101,000 hectares (249,575.30 acres) of mountainous terrain within the Rocky Mountain Forest Reserve. Siffleur Wilderness Area is 41,214.47 ha (101,843.20 acres) in size, White Goat Wilderness Area is 44,457.14 ha (109,856.00 acres), and Ghost River Wilderness Area is 15,317.18 ha (37,849.60 acres). The Ghost River Wilderness Area is not dealt with further in this study.

Both Siffleur and White Goat Wilderness Areas border Banff National Park on the eastern park boundary. White Goat Wilderness Area also abuts the southeastern boundary of Jasper National Park. Both Wilderness Areas are situated in the vicinity of the Kootenay Plains and Abraham Lake. The eastern portion of the White Goat area is located about 8 km (5 miles) west of Abraham Lake, along the Cline River; the northern portion of the Siffleur area is located about 11 km (6 miles) south of Abraham Lake, along the Siffleur River.

As each of these areas lie within unsurveyed portions of the province, legal descriptions of the land bounded within each wilderness area are quite general and expressed rather by an official sketch map (Figures 1 and 2). Appendix 1 gives the land descriptions.

Mountain and valley systems impart a rugged topography to each of the two wilderness areas. Relief in the Siffleur area is 1,894m (6,212 feet) and in the White Goat area is 1,851m (6,073 feet). In the Siffleur Wilderness Area, elevations range from 1,464m (4,800 feet) along the Siffleur River to 3,358m (10,566 feet). Relief is greatest in the White Goat Wilderness Area where elevations range from 1,464m (4,800 feet) in the Cline River valley to 3,315m (10,869 feet) on Mt. Stewart.

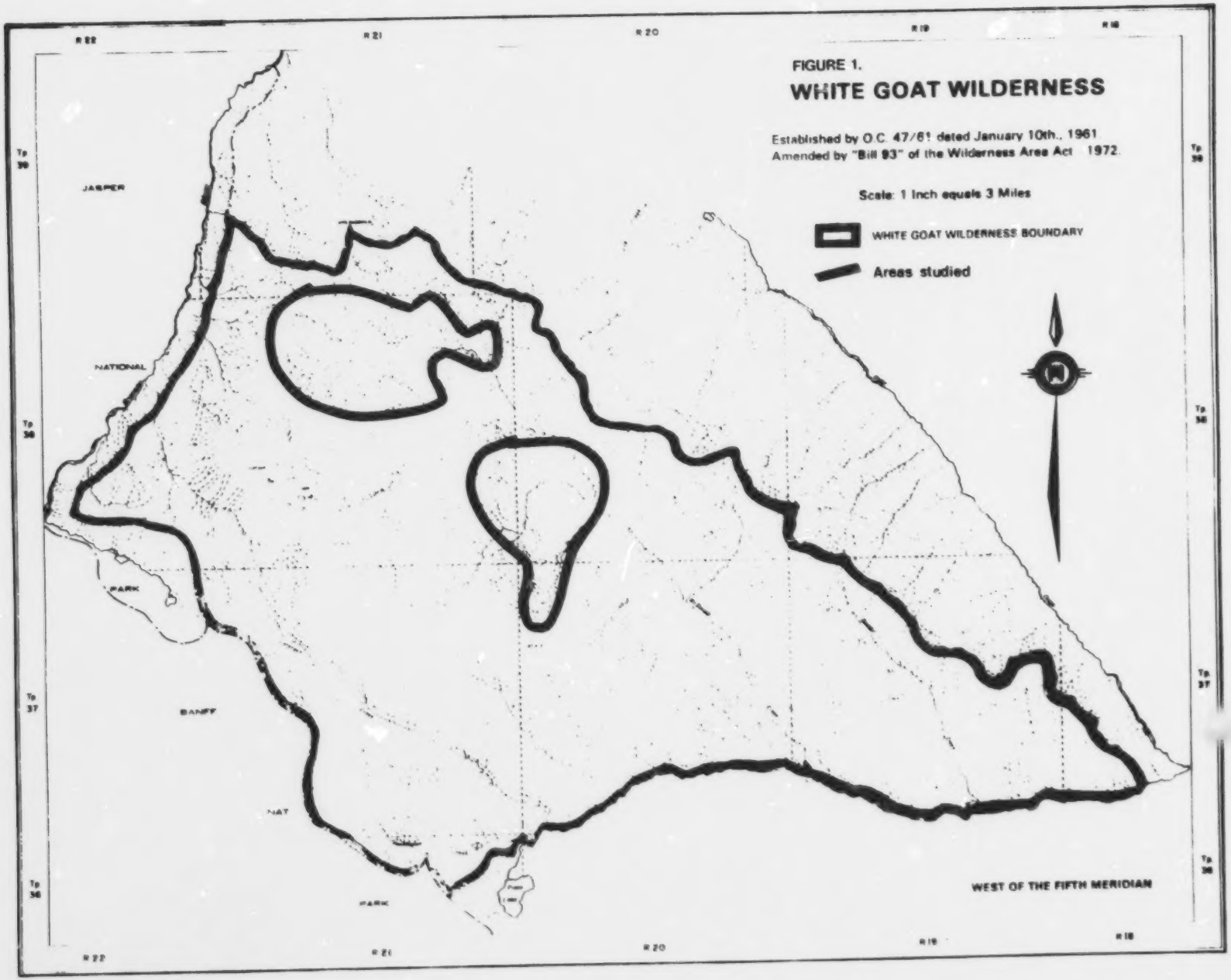
FIGURE 1.
WHITE GOAT WILDERNESS
Established by O.C. 47/61 dated January 10th., 1961
Amended by "Bill 93" of the Wilderness Area Act 1972.
Scale: 1 Inch equals 3 Miles
WHITE GOAT WILDERNESS BOUNDARY
Areas studied
R 22
R 21
R 20
R 19
R 18
Tp 39
Tp 38
Tp 37
Tp 36
JASPER
NATIONAL
PARK
BANFF
NAT
PARK
WEST OF THE FIFTH MERIDIAN

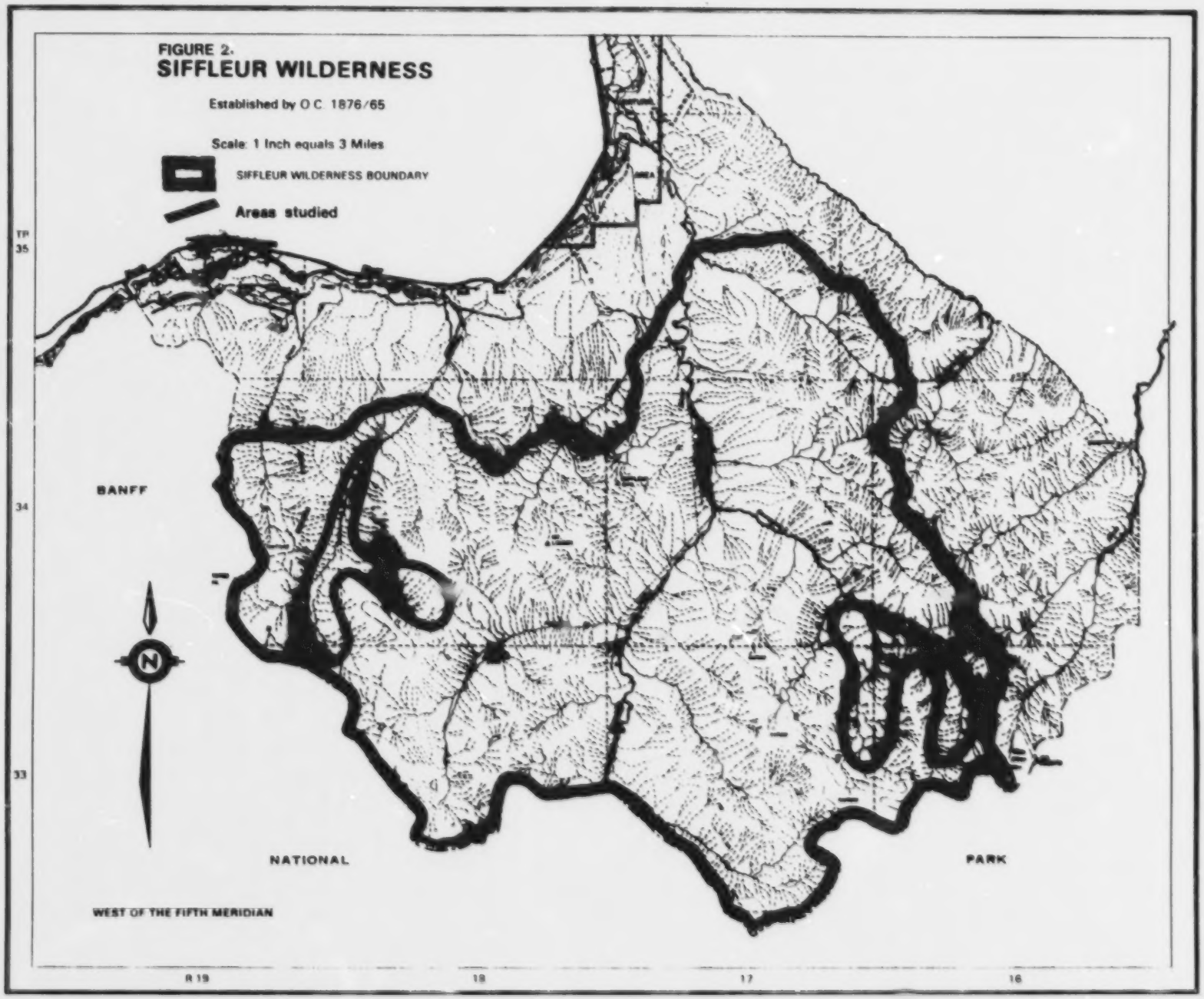
FIGURE 2.
SIFFLEUR WILDERNESS
Established by O.C. 1876/65
Scale: 1 Inch equals 3 Miles
SIFFLEUR WILDERNESS BOUNDARY
Areas studied
TP
35
34
33
BANFF
N
NATIONAL
PARK
WEST OF THE FIFTH MERIDIAN
R 19
18
17
16

LEGISLATION[1]

The Siffleur and White Goat Wilderness Areas were established under provisions of Section 10 of the Forest Reserves Act (1950) by Order-in-Council January 10, 1961 (O.C. 46/61, O.C. 47/61). An area of 1,678.37 sq.km (647.85 sq.miles) was set aside as wilderness in these two reserves. Neither purpose nor criteria for wilderness was specified in the legislation. Government reservations were placed on all mines and minerals in the two areas; however, in the case of the White Goat Wilderness Area, some petroleum and natural gas leases were subsequently taken out.

In 1965, both areas were re-established under the Public Lands Act (Alberta Regulation 55⁰/65) by Order-in-Council (O.C. 1876/65). The purpose of this action was to place restrictions on land disposition in the wilderness areas, possibly to avoid further leasing situations as occurred after the 1961 establishment.

The establishment of wilderness areas via Order-in-Council did not ensure that these lands would be protected from resource allocation and development. Public hearings were held across the province in 1970 in response to public pressures for wilderness preservation. A wilderness bill was prepared and presented at these hearings and after revisions, became the Wilderness Areas Act (chapter 114) of 1971. This act re-established the areas under the newly coined category of "provisional wilderness area". These areas were now subject to a size review by an appointed Advisory Committee or Wilderness Areas because of a 373 sq.km (144 sq.mile) size limitation incorporated within the Act.

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1 Information on chronologic history of establishment of wilderness areas taken from: Kregosky, Brian, 1975. Recreational and scenic analysis of a Rocky Mountain Wilderness. M.Sc. thesis, University of Calgary.

Preamble to the Wilderness Areas Act summarizes the basic purposes of the legislation. "Continuing expansion of industrial development and settlement in Alberta will leave fewer areas in their natural state of wilderness . . . It is in the public interest that certain areas of Alberta be protected and managed for the purpose of preserving their natural beauty and primeval character and influence and safeguarding them from impairment and industrial development and from occupation by man other than as a visitor." Incorporated within the Act were significant restrictions on activities permitted within the wilderness areas such as resource disposition and exploitation; development of any road, structure, installation, etc., and any other action which leaves evidence of man's activity in the wilderness areas (horse or motorized travel, hunting, trapping and fishing).

Legislation pertaining to the Wilderness Areas was modified by the Wilderness Areas Amendment Act (chapter 122, 1972), enacted in in January, 1973. Land use and recreational restrictions were retained as in the original legislation. The size limitation of 373 sq.km (144 sq.miles) was deleted, but the White Goat Wilderness Area was reduced in size from 1,266.11 sq.km (488.72 sq.miles) to 444.69 sq.km (171.65 sq.miles) as recommended by the Advisory Committee; Siffleur Wilderness Area was retained in its original size. The concept of controlled buffer zones was added to the amended legislation. The new section 11.1 allowed for the designation of land adjoining a wilderness area as a controlled buffer zone in which surface impact from strip mining or quarrying and any manipulation of water resources (e.g. diversion, dam and hydro-electric installation) is prohibited. Those lands which had been deleted from the White Goat Wilderness Area (821.42 sq.km, 317.07 sq.miles) were recommended for interim protection under the restricted development clause of the Department of Environment Act (chapter 24, 1971); however, neither it nor the controlled buffer zone designation has been applied to those lands withdrawn from the original wilderness area.

BEDROCK AND SURFICIAL GEOLOGY

Both White Goat and Siffleur Wilderness Areas are in the western portion of the Cordilleran Physiographic Province within the Rocky Mountain thrust belt. This belt is composed almost entirely of folded sedimentary strata.

Based on differences in structure and stratigraphy, the Rocky Mountain thrust belt can be divided into three major sectors; the Foothills, Front Ranges and Main Ranges. Changes in the thickness of sedimentary sequences and structural levels exposed give each sector different stratigraphy, topography, structure and consequent vegetation.

White Goat and Siffleur Wilderness Areas each encompass a small portion of the Rocky Mountain Front Ranges, but are primarily within the eastern Main Ranges.

The Front Range sector is composed primarily of Devonian to Triassic rocks. "The structure within it is characterized by the presence of six or less main thrust slices that dip moderately to steeply west. These form the characteristic rugged linear ranges of resistant Paleozoic carbonate rock separated by valleys carved from the weaker Mesozoic shales and sandstones" (Price and Mountjoy 1970). The ridges are generally serrated in outline; northeast slopes tend to be sharp and steep, southwest slopes tend to be low and gentle, following the southwest dipping bedding planes. Locally, cliff-forming Paleozoic carbonates are exposed. The main rivers in the Front Ranges are commonly entrenched in narrow, flat-bottomed valleys and tend to flow northeast, with tributaries trending northwest or southeast.

The boundary between the front and main ranges is defined by Price and Mountjoy (1970) as "the segments of various thrust faults beyond which the level of exposure is Pre-Devonian". The main ranges are divisible into eastern and western sections, which are structurally and physiographically different due to a facies change. In the eastern section, Lower Paleozoic facies are primarily composed of carbonates,

while Lower Paleozoic facies in the western section are mainly argillaceous shale and slate.

Price and Mountjoy (1970) describe the eastern main ranges as formed by thrust plates. In the western main ranges, thrust faults are rare. The western ranges are "characterized by the widespread occurance of cleavage and complex patterns of folding" (Price and Mountjoy 1970). They tend to be less craggy, with heavier vegetation cover than the eastern main ranges.

Bedrock underlying the White Goat and Siffleur Wilderness Areas range from Proterozoic to lower Jurassic age and is composed mainly of late Precambrian to late Jurassic rocks.

The stratigraphy and lithology of bedrock units within the Rocky Mountains have been described in numerous reports and maps, many of which are near or include White Goat and/or Siffleur Wilderness Areas (Cook 1975, McLaren 1955, McLaren and Mountjoy 1962, Gibson 1974, Barnes 1978, Ozoray and Barnes 1978).

Barnes (1978) includes a map of the bedrock structure which covers the White Goat Wilderness Area. Ozoray and Barnes (1978) include a similar map which covers the Siffleur Wilderness Area.

Research on the glacial history of the foothills and Rocky Mountains is reviewed in Reimchen and Bayrock (1977). Evidence suggests that there were extensive Pre-Wisconsin Cordilleran glaciations which almost entirely covered the mountains and foothills.

Wisconsin cordilleran glaciations were less extensive, and generally "started out at elevations of approximately 8,500 feet, flowed eastward and coalesced to form piedmont glaciers at the outer edge of the foothills" (Reimchen and Bayrock 1977). The earliest Wisconsin glaciers probably covered most of the mountains, with only small nunataks exposed. The more recent Wisconsin glaciers were expanded foot or peidmont type valley glaciers, occupying major mountain valleys such as

the North Saskatchewan, Athabasca and Bow River Valleys. Reimchen and Bayrock (1977) estimated that at the time of this latest Wisconsin glaciation, over 90% of the area in the mountains and foothills between major river valleys was ice-free.

In the area of White Goat and Siffleur Wilderness Areas, Reimchen and Bayrock (1977) present evidence for three major cordilleran glaciations. Kregosky (1975) suggests that glaciers of the latest cordilleran advance extended down the North Saskatchewan River to approximately the site of the Bighorn Dam. Eastward - trending striations in the Sunset Pass area suggest that ice spilled over Sunset Pass and down into the Cline River Valley. At this time, there were probably lateral feeder glaciers in all main valleys.

Modifications imposed by glaciation include widening of major river valleys and deposition of vast amounts of detritus. Some of the till deposits have been re-worked and sorted by modern water action, but others have been left in-situ.

A series of six maps by Reimchen and Bayrock (1980) delineate the surficial geology of the Rocky Mountains and Foothills. Of this series, Map 3 covers the White Goat Wilderness Area and Maps 3 and 4 include the Siffleur Wilderness Area.

The types of surficial deposits delineated include glacial tills and glaciofluvial deposits. These usually occur as valley fill, and probably were deposited by the late Wisconsin glaciations. Cirque tills are evidently modern day deposits. Non-glacial surficial deposits present include rock glaciers, stream alluvium, alluvial fans and aprons, colluvium, talus and rockslide deposits.

Bedrock exposures cover large areas of both wilderness areas. Slightly leached till deposits occur in the valleys in the form of ground and lateral moraines. In the White Goat, tills of this type were deposited in the Cline River and the McDonald and Cataract Creek Valleys. In the Siffleur, they are found along the Siffleur River and Spreading Creek.

A small area of meltwater channel deposits is located in Siffleur Wilderness, at the head of a tributary of the Siffleur River. Deposits here are gravel and minor sand. Kame deposits are found only in a small area in the northernmost part of the Siffleur, along the Siffleur River. Eskers are relatively rare, but are found in two separate areas of the Siffleur. Valley train deposits can be found in the White Goat Wilderness along the Cline River, at the mouth of McDonald Creek and along two tributaries of McDonald Creek. In the Siffleur Wilderness, they are found only in a small area along a tributary of the Escarpment River. Lag gravels are only found in a small spot in the Siffleur just west of Porcupine Lake. Glaciolacustrine deposits are found only in the White Goat, in small areas at the base of icefields at the headwaters of Cataract Creek.

Cirque tills are relatively common throughout both Wilderness Areas. There are several rock glaciers in the Siffleur Wilderness area but only one in the White Goat, in the Cataract Creek valley. Small cirque ice glaciers are common in both wilderness areas. A surprising additional amount of buried glacial ice still remains producing ice-cored moraines and thermokarst lakes.

Coarse stream alluvium are found along Cataract Creek in the White Goat and along the Siffleur River, and a small stretch of Spreading Creek in the Siffleur Wilderness. Fine stream alluvium is only found in one small spot in the Siffleur, near Porcupine Lake. Alluvial fans and aprons are situated primarily along the sides of major valleys along Escarpment River, Siffleur River and Spreading Creek in the Siffleur Wilderness Area, and along McDonald Creek, Cataract Creek and the Cline River in White Goat Wilderness.

Colluvium covers the largest area of surficial deposits in the wilderness areas. Talus and rockslide deposits are also numerous in both wilderness areas and occur at the base of steep cliffs. A spectacular colluvium-covered "dry valley" is above and parallel to the east side of the McDonald Creek, a short distance upstream from its confluence with the Cline River.

GAME SPECIES

The Alberta Fish and Wildlife Division (of Alberta Energy andNatural Resources) conducted a provincial survey of bighorn sheep, goats and elk in the 1971/1972 winter (Cook 1980). They reported total provincial sightings of 2,896 sheep, of which 980 (34%) occurred in the Red Deer Region (although regional boundaries have been changed, this region included an area between the north boundary of the Ghost River Wilderness Area in the south to the Southesk River in the north), 22 (1%) occurred in the White Goat Wilderness and 25 (1%) occurred in the Siffleur Wilderness. Two hundred and forty-five (245) mountain goats were sighted in the province, of which 19 (8%) occurred in the Red Deer Region, 8 (3%) occurred in the White Goat Wilderness and 11 (5%) occurred in the Siffleur Wilderness. Four hundred and twenty-seven (427) elk were sighted in the province, of which 222 (52%) occurred in the Red Deer Region, 7 (2%) were reported for the White Goat and none were reported for the Siffleur. Based on this study, neither the White Goat nor the Siffleur Wilderness Areas appears to contain substantial populations of sheep, goats, or elk.

Bibaud and Hall (1981) (of Fish and Wildlife) conducted a summer aerial survey of the wilderness areas and other sites of sheep and goats in 1976. Table 1 compares sightings in the White Goat and Siffleur between 1966 and 1976. Although it is difficult to assess the accuracy of these aerial surveys, it appears that sheep are more prevalent in the White Goat, and mountain goat are more prevalent in the Siffleur.

Caribou have been previously reported for the White Goat (Eldon Bruns, Fish and Wildlife Division, personal communication) and 7 were spotted during the course of the present study in the large alpine basin at upper McDonald Creek on July 30, 1981.

During the present study, brief notes were made of faunal use of different habitats (Table 2). Bear sign (diggings and scats) was found in spruce-pine-heather-crowberry-moss closed forest, fir-spruce-heather open forest and willow-birch-cinquefoil-sedge-moss shrubland. Ptarmigan

sign was most frequently seen in fir-spruce-heather open forest and heather-mountain avens-willow low shrub-herb types. A very few number of elk pellets were reported from the spruce-pine-willow-grass closed forest and willow-grass-goldenrod shrublands. Moose sign was mostly evident in valley bottoms - spruce-willow alluvial flats, willow-grass-goldenrod slopes, willow-strawberry-sedge alluvial flats and especially in the willow-birch-cinquefoil-sedge-moss shrublands. Sheep sign was common and was most heavy in the mountain avens-willow tundra and lesser amounts in the heath-mountain avens-willow, grass-fireweed slopes and rock scree communities (Table 2). Most ungulate browsing appeared to occur on Betula spp. shrubs with lesser amounts on willows.

TABLE 1: Comparison of Sightings of Sheep and Goats in the White Goat and Siffleur Wilderness Areas between 1966 and 1976 (Bibaud and Hall 1981)

	White Goat		Siffleur	
	Sheep	Goat	Sheep	Goat
1966	15	1	27	77
1967	194	21	32	34
1969	13	10	0	0
1973	52	4	0	44
1976	103	13	6	38

TABLE 2: Notes of Faunal Use of Plant Communities

CLOSED FOREST

- Picea engelmannii - Pinus contorta/Phyllodoce glanduliflora - Empetrum nigrum/moss-lichen
  - bear scat found
- Picea engelmannii - Pinus contorta/Salix glauca/Elymus innovatus
  - a few elk pellets

OPEN FOREST

- Picea engelmannii - Salix drummondiana
  - moose pellets
  - light browsing of Salix drummondiana
- Abies lasiocarpa - Picea engelmannii/Phyllodoce glanduliflora - Cassiope spp.
  - many ptarmigan droppings
  - grizzly scat composed of Arctostaphylos uva-ursi

SHRUB

- Salix glauca/Elymus innovatus - Solidago multiradiata
  - a few deer, elk and moose pellets
  - a few ground squirrel holes
- Salix spp. - Betula spp. - Potentilla fruticosa/Carex capillaris/Tomenthypnum nitens
  - occasionally many moose pellets
  - a very few deer pellets
  - light to moderate browsing on Betula glandulosa and light browsing on willows
  - grizzly diggings of Hedysarum alpinum
  - some ground squirrel holes

LOW SHRUB-HERB

- Cassiope tetragona - Dryas spp. - Salix nivalis
  - few to moderate amount of sheep pellets
  - some ptarmigan droppings
- Phyllodoce glanduliflora/Salix spp. - Antennaria lanata
  - small amount of sheep pellets

HERB-DWARF SHRUB

- Dryas octopetala - Salix nivalis/Salix arctica
  - moderate to heavy amount of sheep pellets
- Elymus innovatus - Epilobium angustifolium
  - small amount of sheep pellets
- Scree
  - small amount of sheep pellets

VEGETATION

INTRODUCTION

There has been only one previous study of the vegetation of the White Goat Wilderness (Brathay Exploration Group 1980). Table 3 lists the alpine vegetation types that the study recognized. It reports that the Betula glandulosa - Salix barrattiana (Dwarf birch-willow) type was considered to be the most extensive in the upper McDonald Creek alpine basin, followed by the Phyllodoce glanduliflora (Yellow heath), and then the Cassiope tetragona - Dryas octopetala (Mountain heather - mountain avens) vegetation types. Of the alpine areas that are vegetated, that report recognized 12 vegetation types (Table 3).

In the present study, the vegetation was classified into 32 community types within 5 physiognomic groups (Table 4). The Closed Forest group has 8 community types, the Open Forest group has 5 types, Shrub has 7 types, the Low Shrub-Herb has 5 types, and the Herb-Dwarf Shrub group has 9 community types within it. Detailed information on each type can be found in Appendix 3.

PLANT COMMUNITY TYPES

The vast majority of areas above treeline are occupied by unvegetated bedrock exposures and talus and rockslide deposits.

Those areas above treeline, or alpine, that are vegetated are occupied by plant communities within the Shrub, Low Shrub-Herb and Herb-Dwarf Shrub physiognomic groups. The two most prevalent alpine plant community types in both the White Goat and Siffleur Wilderness Areas are the Phyllodoce glanduliflora/Salix spp. - Antennaria lanata and the Dryas octopetala - Salix spp. types followed by the Salix spp. - Betula glandulosa/Phyllodoce glanduliflora and the Cassiope tetragona - Dryas octopetala - Salix nivalis types.

TABLE 3: Vegetation Types Recognized by the Brathay Exploration Group in the White Goat Wilderness Area (1980)

1. Bare rock and shale
2. Sliderock colonizers
3. High alpine colonizers
4. Yellow heath (Phyllodoce glanduliflora)
5. White mountain heather/mountain avens (Cassiope tetragona/Dryas octopetala)

5a. Mountain avens (Dryas octopetala)

6. Streamside and seepage areas
7. Creek gorges
8. Dwarf birch/Barratt's willow (Betula glandulosa/Salix barrattiana)
9. Snowpatch (Carex spp.)
10. Wet willow (Salix nivalis)
11. Mountain avens/willow (Dryas octopetala/Salix nivalis)
12. Willow/grass (Salix glauca/grass)
13. Boggy pool
14. Willow/bearberry (Salix spp./Arctostaphylos uva-ursi)
15. Tundra grassland
16. Shale deposit colonizers
17. Pussytoes/yellow heath (Antennaria lanata/Phyllodoce glanduliflora)
18. Fir/spruce woodland (Abies lasiocarpa/Picea engelmannii)

TABLE 4: Plant Community Types of the Alpine and Upper Subalpine Zones Within the White Goat (W) and Siffleur (S) Wilderness Areas

	W	S
CLOSED FOREST		
1. *Pinus contorta/Juniperus communis/Arctostaphylos uva-ursi - Elymus innovatus* (Pine/juniper/bearberry - hairy wild rye)	X	X
2. *Picea engelmannii - Pinus contorta/Phyllodoce glanduliflora - Empetrum nigrum*/moss-lichen (Spruce - pine/yellow heath - crowberry/moss-lichen)	X	
3. *Picea engelmannii - Abies lasiocarpa/Phyllodoce glanduliflora - Vaccinium scoparium*/moss (Spruce - fir/yellow heath - grouseberry/moss	X	X
4. *Pinus contorta - Picea engelmannii/Elymus innovatus*/moss (Pine - spruce/hairy wild rye/moss)	X	
5. *Picea engelmannii - Pinus contorta/Salix glauca/Elymus innovatus* (Spruce - pine/glaucous willow/hairy wild rye)	X	
6. *Picea engelmannii - Abies lasiocarpa/Equisetum arvense* (Spruce - fir/horsetail)		X
7. *Abies lasiocarpa - Picea engelmannii*/moss (Fir - spruce/moss)		X
8. *Picea engelmannii - Abies lasiocarpa/Salix vestita/Cassiope tetragona* (Spruce - fir/rock willow/white mountain heather)	X	X
OPEN FOREST		
1. *Picea engelmannii/Salix glauca - Shepherdia canadensis/Elymus innovatus* (Spruce/glaucous willow - buffalo berry/hairy wild rye)		X
2. *Picea engelmannii/Salix drummondiana* (Spruce/willow)		X
3. *Abies lasiocarpa - Picea engelmannii/Phyllodoce glanduliflora - Cassiope* spp. (Fir - spruce/yellow heath - white mountain heather)	X	X
4. *Abies lasiocarpa/Valeriana sitchensis* (Fir/valerian)		X
5. *Picea engelmannii - Abies lasiocarpa/Salix vestita/ Arctostaphylos rubra* (Spruce - fir/rock willow - bearberry)	X	

		W	S
SHRUB			
1.	Salix glauca/Elymus innovatus - Solidago multiradiata (Glaucous willow/hairy wild rye - goldenrod)	X	X
2.	Salix glauca/Danthonia intermedia (Glaucous willow/timber oat grass)	X	
3.	Abies lasiocarpa - Salix glauca (Fir - glaucous willow)	X	
4.	Salix glauca/Fragaria virginiana - Kobresia myosuroides (Glaucous willow/strawberry - sedge)	X	
5.	Salix spp. - Betula glandulosa/Phyllodoce glanduliflora (Willow - dwarf birch/yellow heath)	X	
6.	Salix barrattiana/Salix nivalis (Barratt's willow/dwarf willow)	X	X
7.	Salix spp. - Betula spp. - Potentilla fruticosa/Carex capillaris/Tomenthypnum nitens (Willow - dwarf birch - shrubby cinquefoil/sedge/moss)	X	X
LOW SHRUB-HERB			
1.	Arctostaphylos uva-ursi/Salix glauca (Bearberry/glaucous willow)	X	
2.	Cassiope tetragona - Dryas octopetala (integrifolia) - Salix nivalis (White mountain heather - mountain avens - dwarf willow)	X	X
3.	Phyllodoce glanduliflora/Salix spp. - Antennaria lanata (Yellow heath/willow - pussytoes)	X	X
4.	Phyllodoce glanduliflora - Cassiope mertensiana/Trollius albiflorus (Yellow heath - white mountain heather/globeflower)		X
5.	Salix arctica - Antennaria lanata (Arctic willow - pussytoes)	X	
HERB-DWARF SHRUB			
1.	Dryas octopetala - Kobresia myosuroides (Mountain avens - sedge)	X	X
2.	Dryas octopetala - Salix nivalis/Salix arctica (Mountain avens - dwarf willow/arctic willow)	X	X

		W	S
3.	Elymus innovatus - Epilobium angustifolium (Hairy wild rye - fireweed)		X
4.	Dryas drummondii/Salix brachycarpa (drummondiana) (Mountain avens/willow)		X
5.	Scree	X	X
6.	Carex nigricans - Antennaria lanata (Sedge - pussytoes)	X	X
7.	Salix nivalis/moss (Dwarf willow/moss)	X	X
8.	Caltha leptosepala (Mountain marigold)		X
9.	Carex aquatilis - Carex rostrata (Sedge)	X	X

The driest vegetated sites occur on steep south-facing slopes and are usually occupied by the Arctostaphylos uva-ursi/Salix glauca type. As the south-facing slopes become progressively less steep, communities belonging to the Dryas octopetala - Kobresia myosuroides type occasionally occur, followed by the abundant Dryas octopetala - Salix nivalis - Salix arctica type which occur on both south- and north-facing slopes.

North-facing vegetated slopes in the alpine are occupied occasionally by communities within the Cassiope tetragona - Dryas octopetala - Salix nivalis type, but more commonly and abundantly by communities within the Phyllodoce glanduliflora/Salix spp. - Antennaria lanata type. More mesic, gently sloping and/or protected areas are occupied commonly by communities within the Salix barrattiana/Salix nivalis type. The Abies lasiocarpa - Salix glauca type frequently occupies moist, steep, south-facing slopes.

The remaining communities and community types are either very small in size and/or occur very infrequently. The Phyllodoce glanduliflora - Cassiope mertensiana - Trollius albiflorus community and the Salix arctica - Antennaria lanata community were only reported once each from mesic, gently sloping sites. Wet sites occupied by Carex aquatilis - Carex rostrata communities were occasionally reported and sampled but occupied small areas. Similarly, mesic seepage areas were commonly occupied by Carex nigricans - Ranunculus escholtzii and Caltha leptosepala and Salix nivalis - Carex nigricans communities. Some talus slopes and active colluvium slopes (lumped as Scree) were occasionally heavily vegetated.

Those areas below treeline, or subalpine, that are vegetated are occupied by plant communities within the Closed Forest, Open Forest, Shrub and Herb-Dwarf Shrub physiognomic groups. Non-forested communities in the subalpine occupy very moist to wet, gently sloping sites in valley bottoms (i.e. Salix spp. - Betula spp. - Potentilla fruticosa/Carex capillaris/Tomenthypnum nitens and Salix barrattiana/Salix nivalis or Dryas drummondii/Salix brachycarpa (drummondiana) community types);

drier, south-facing gentle to moderate slopes (i.e. Salix glauca/Elymus innovatus - Solidago multiradiata and Salix glauca/Danthonia intermedia community types); dry, steep south-facing slopes (Elymus innovatus - Juniperus communis - Arctostaphylos uva-ursi); and very steep, moist slopes at higher elevations (i.e. Abies lasiocarpa - Salix glauca).

Timberline forest communities are commonly those of the Open Forest group, and the Abies lasiocarpa - Picea engelmannii/Phyllodoce glanduliflora - Cassiope tetragona - Vaccinium scoparium type appears to be most abundant. However, the Closed Forest type Picea engelmannii - Abies lasiocarpa/Phyllodoce glanduliflora - Vaccinium scoparium type also occurs close to timberline.

Steep, south-facing forested slopes are occupied by communities within the Pinus contorta/Juniperus communis/Arctostaphylos uva-ursi - Elymus innovatus type or the Pinus contorta - Picea engelmannii/Salix glauca/Elymus innovatus type. The most common and extensive type on north-facing slopes is the Picea engelmannii - Abies lasiocarpa/Salix vestita/Cassiope tetragona type. Moderate slopes are commonly occupied by Pinus contorta - Picea engelmannii/Salix glauca/Elymus innovatus type and Picea engelmannii - Pinus contorta/Phyllodoce glanduliflora - Empetrum nigrum/moss - lichen type. The most mature forest communities sampled were those of the Abies lasiocarpa - Picea engelmannii/moss type.

ALPINE TRANSECTS

Two transects were sampled in the alpine basin at upper McDonald Creek in the White Goat Wilderness. This basin contains the most extensive vegetated alpine site in the two wilderness areas. We were interested in the extent and distribution of the various community types.

Eleven community types were described, four within the Shrub, three within the Low Shrub-Herb, and four within the Herb-Dwarf Shrub Physiognomic Groups (Figure 3).

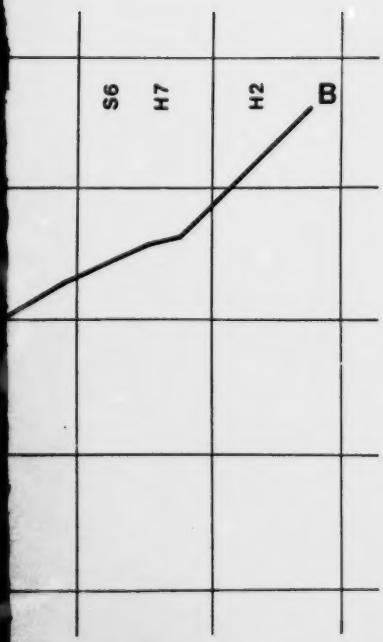
A
H6
L3
H2
H2
L3
S6
L3
H5
H2
H2
L2
L3
L3
L3
L3
L3
S6
L3
S5
L3

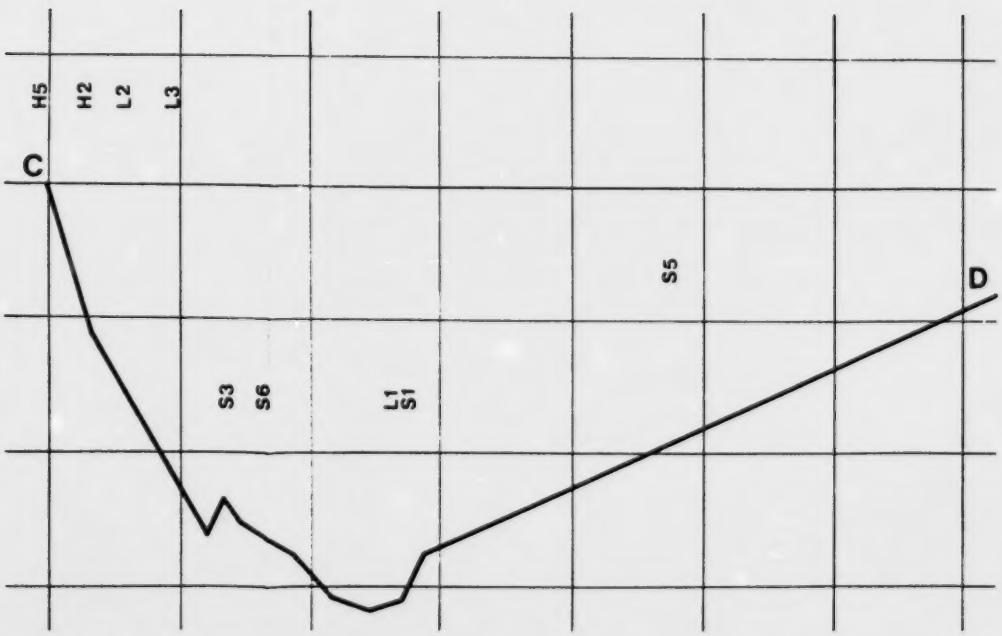
Figure 3. Upper McDonald Creek alpine basin and plant community transects (White Goat Wilderness)

1km 1km 1km

LEGEND

	Community Types	% of Transects
S1	Willow/hairy wild rye-goldenrod	1%
S3	Fir/glaucous willow	1%
S5	Willow-dwarf birch/yellow heath	24%
S6	Willow/dwarf willow	8%
L1	Bearberry/glaucous willow	1%
L2	White mountain heather-mountain avens-dwarf willow	7%
L3	Yellow heath/willow-pussytoes	31%
H2	Mountain avens-dwarf willow/arctic willow	17%
H5	Scree	8%
H6	Sedge-pussytoes	1%
H7	Dwarf willow/moss	1%





The most extensive type was the Phyllodoce glanduliflora/Salix spp. - Antennaria lanata ct. which comprised 31% of the transects, followed by the Salix spp. - Betula glandulosa/Phyllodoce glanduliflora ct. (24%) and the Dryas octopetala - Salix nivalis/Salix arctica ct. (17%).

FLORA

COMPOSITION

The vascular flora of the alpine and upper subalpine zone of the White Goat and Siffleur Wilderness Areas presently consists of 43 Families comprising 47 Genera and 329 Species. Species - rich Families include Compositae (50), Cyperaceae (37), Gramineae (24), Cruciferae (22), Saxifragaceae (18), Ericaceae (16), Ranunculaceae (16) and Rosaceae (16). Species - rich Genera include Carex (26), Draba (11), Saxifraga (11), Salix (9), Arnica (8), Antennaria (8), Erigeron (9) and Senecio (6). Further information can be found in Appendix 2. Some non-vascular species were collected and are listed in Appendix 2.

SIGNIFICANT SPECIES

Criteria used for determining significance were published rarity (R) or uncommonness (U) (Argus and White 1978, Packer and Bradley 1978) and/or uncommon or rare in the two wilderness areas (UW) and/or distributionally important species (D).

There are a total of 81 significant species. Twenty-one species are listed as rare (R), 22 as uncommon (U) in Alberta, 52 as being uncommon or rare in the two wilderness areas (UW) and 29 as being distributionally important (D). Of the 29 distributionally important species, Artemesia norvegica and Ranunculus occidentalis are important because they are generally more northerly species. The remaining 27 species are distributionally more abundant to the south or west of the White Goat and Siffleur Wilderness Areas. A mustard, Draba stenopetala (Trautv), is a new record for the province, otherwise being found mainly in a few areas of the Yukon Territory, Alaska and Eastern Siberia (Hulten 1968).

In the list below, (W) indicates occurrance in the White Goat, and (S) indicates occurrance in the Siffleur.

Agropyron latiglume (Scribn. and Smith) Rydb.: Status = D. Location = W and S, alpine and subalpine.

Anemone narcissiflora L.: Status = R, UW. Location = W, alpine ridge, upper McDonald Creek.

Antennaria alpina (L.) Gaertn. var. media (Greene) Jeps.: Status = R. Location = W and S, alpine and alpine scree.

Arabis lemmonii S. Wats.: Status = U, D. Location = W, alpine.

Arnica alpina (L.) Olin spp. angustifolia (M. Vahl) Maquire: Status = R. Location = W and S, alpine and subalpine.

Arnica diversifolia Greene: Status = D. Location = W and S, alpine and subalpine.

Arnica fulgens Pursh: Status = UW. Location = W, subalpine.

Artemesia norvegica Fries: Status = U, D. Location = W, alpine.

Aster foliaceous Lindl.: Status = D, UW. Location = S, subalpine.

Astragalus vexilliflexus Sheld.: Status = D. Location = W, alpine.

Barbarea orthocercus Ledeb.: Status = UW. Location = S, subalpine.

Botrychium lanceolatum (Gmel.) Angstra.: Status = R, D. Location = W and S, subalpine.

Braya glabella Richards.: Status = UW. Location = S, subalpine.

Campanula lasiocarpa Cham.: Status = U. Location = W and S, alpine.

Campanula uniflora L.: Status = U, UW. Location = W, alpine.

Cardamine bellidifolia L.: Status = U, UW. Location = W, alpine.

Cardamine umbellata Greene: Status = UW. Location = S, subalpine.

Carex gymnoclada Holm: Status = D, UW. Location = W, alpine.

Carex incondita F. J. Hermann: Status = R. Location = W, alpine.

Carex microglochin Wahlenb.: Status = U, UW. Location = W, subalpine.

Carex physocarpa Presl.: Status = UW. Location = W and S, subalpine.

Carex richardsonii R. Br.: Status = UW. Location = W, subalpine.

Carex umbellata Schk.: Status = U, UW. Location = S, subalpine.

Cerastium brachypodium (Engelm.) Robins.: Status = UW. Location = S, subalpine.

Claytonia megarhiza (A. Gray) Parry: Status = U, D. Location = W and S, alpine.

Crepis elegans (Hook.): Status = UW. Location = S, subalpine.
Deschampsia atropurpurea (Wahlenb.) Scheele: Status = D, UW. Location = S, subalpine.
Delphinium bicolor Nutt: Status = UW, D. Location = W, alpine.
Draba borealis DC.: Status = UW. Location = S, alpine.
Draba macounii O. E. Schulz: Status = U, UW. Location = W, alpine.
Draba paysonii Macbr. var. trelcasii (Schulz) C. L. Hitchc.: Status = UW, D. Location = W, alpine.
Draba stenopetala Trautv: Status = R, UW. Location = W, alpine.
Draba ventosa Gray: Status = R. Location = W, alpine.
Epilobium platyphyllum Rydb.: Status = R, D, UW. Location = W, alpine.
Eriogonum aureus Greene: Status = D. Location = W and S, alpine.
Erigeron grandiflorus Hook: Status = U, UW. Location = W, alpine scree
Erigeron pallens Cronq.: Status = R, UW. Location = W, alpine (reported only by the Brathay Exploration Group, 1980).
Erigeron subalpinum Greene: Status = UW, D. Location = W, alpine.
Eriophorum chamissonis C. A. Mey.: Status = U. Location = W, alpine.
Eriophorum scheuchzeri Hoppe: Status = U. Location = W, alpine.
Erysimum pallasii (Pursh) Fern.: Status = U, UW. Location = W, alpine.
Gentiana glauca Pallas: Status = R, UW. Location = W and S, alpine and subalpine.
Hedysarum sulphurescens Rydb.: Status = D. Location = W, subalpine.
Hierochloe alpina (Sw.) R. and S.: Status = R, UW. Location = W, alpine.
Juncus ensifolius Wikstr.: Status = U, D, UW. Location = W, alpine.
Juncus parryi Engelm.: Status = R, UW. Location = W, alpine.
Leptarrhena pyrifolia (D. Don) R. Br.: Status = U, UW. Location = W, alpine (reported only by Brathay Exploration Group, 1980).
Luetkea pectinata (Pursh) Kuntze: Status = R, UW. Location = W, alpine (reported only by Brathay Exploration Group, 1980).
Luzula glabrata (Hoppe) Desv.: Status = UW. Location = W, alpine.
Luzula wahlenbergii Rupr.: Status = D. Location = W and S, alpine.
Lycopodium selago L.: Status = D. Location = W and S, subalpine.
Menzeisia glabella A. Gray: Status = UW. Location = S, subalpine.
Papaver kluanensis D. Love: Status = U, UW. Location = W, alpine.
Parnassia kotzebuei Cham. and Schlecht.: Status = U. Location = W and S, alpine.

Pedicularis arctica R. Br.: Status = R. Location = W and S, alpine.

Pedicularis flammea L.: Status = R, UW. Location = W, alpine.

Penstemon ellipticus Coult. and Fisher: Status = D. Location = W and S, subalpine.

Phyllodoce intermedia (Hook.) Camp: Status = R. Location = W and S, alpine.

Pinus albicaulis Engelm.: Status = UW. Location = W, alpine.

Poa glauca Vahl.: Status = UW. Location = W, alpine.

Poa longipila Nash: Status = D. Location = W and S, alpine and subalpine.

Polemonium viscosum Nutt.: Status = R, UW, D. Location = W, alpine.

Potentilla diversifolia Lehm.: Status = D. Location = W and S, alpine and subalpine.

Potentilla glandulosa Lindl.: Status = U, UW, D. Location = W, alpine.

Potentilla villosa Pall.: Status = U, UW. Location = W, alpine.

Primula egaliksensis Wormsk.: Status = R, UW. Location = W, subalpine.

Ranunculus cardiophyllus Hook.: Status = UW. Location = W, alpine.

Ranunculus occidentalis Nutt.: Status = UW, D. Location = W, alpine.

Ranunculus verecundus Robins.: Status = R, UW, D. Location = W, alpine.

Rhododendron albiflorum Hook.: Status = UW. Location = W, subalpine.

Romanzoffia sitchensis Bong.: Status = U, UW. Location = W and S, alpine.

Rumex alpestris (Scop.) Love: Status = D. Location = W and S, alpine.

Salix farrae Ball: Status = D. Location = W and S, subalpine.

Saxifraga ferruginea Graham: Status = U, UW. Location = W, alpine.

Saxifraga lyallii Engl. x S. odontoloma Piper: Status = R. Location = W and S, alpine and subalpine.

Scirpus pumilis Vahl.: Status = U, UW. Location = W, alpine and subalpine.

Senecio cymbalarioides Buek (non Nutt.): Status = R. Location = W and S, subalpine.

Stenanthium occidentale A. Gray: Status = UW. Location = S, subalpine.

Valeriana sitchensis Bong.: Status = D. Location = W and S, alpine and subalpine.

Veratrum escholtzii A. Gray: Status = UW. Location = S, subalpine.

Woodsia scopulina D. C. Eat.: Status = UW. Location = S, subalpine.

COMPARISON WITH OTHER PROTECTED SITES IN ALBERTA

The White Goat and Siffleur Wilderness Areas contain portions of two major biogeographic zones - Alpine and Subalpine. Other protected areas in the province in which these zones occur include Waterton, Banff and Jasper National Parks, Kananaskis Provincial Park, Ghost River Wilderness, Willmore Wilderness Park, and candidate Ecological Reserves - Beehive Mountain, Plateau Mountain, Upper Evans-Thomas, Elbow-Sheep Divide, Mount Buller and Cardinal River Divide (Figure 4). There are important differences in biophysical features among all of these protected sites, due mainly to various geologic, climatic and glacial history factors.

NATIONAL AND PROVINCIAL PARKS

Waterton National Park is located almost entirely in the western section of the Main Ranges. Kuchar (1973) reports on the unusual (for Alberta) vegetation and flora of Waterton and states that they are due mainly to Waterton's "critical geographical location and fire history". The climate is slightly maritime, much different from areas farther to the north.

Waterton's flora and vegetation are more closely related to those of the northern United States than to those of Canada's Rocky Mountains. Ogilvie (1962) states that the Alberta Rocky Mountains south of about 50°N latitude are floristically different from those north of that approximate line. Southern alpine vegetation differs notably from northern alpine vegetation; in the south, Cassiope spp. and Phyllodoce spp. community types are lacking while graminoid and some herbaceous types are abundant. Southern subalpine vegetation includes limber pine scrub forests, mixed forests with aspen, fir-alpine larch forests, fir-spruce/false azalea forests and fir-white-bark pine/beargrass forests. These are not found in the northern subalpine. Much of the subdominant flora in many of the southern forested communities is more similar to west coast mountains than to areas such as Banff/Jasper.

54
120
119
54
Willmore Wilderness Park
118
53
119
Jasper National Park
117
Cardinal Divide Candidate Ecological Reserve
53
118
116
White Goat Wilderness Area
52

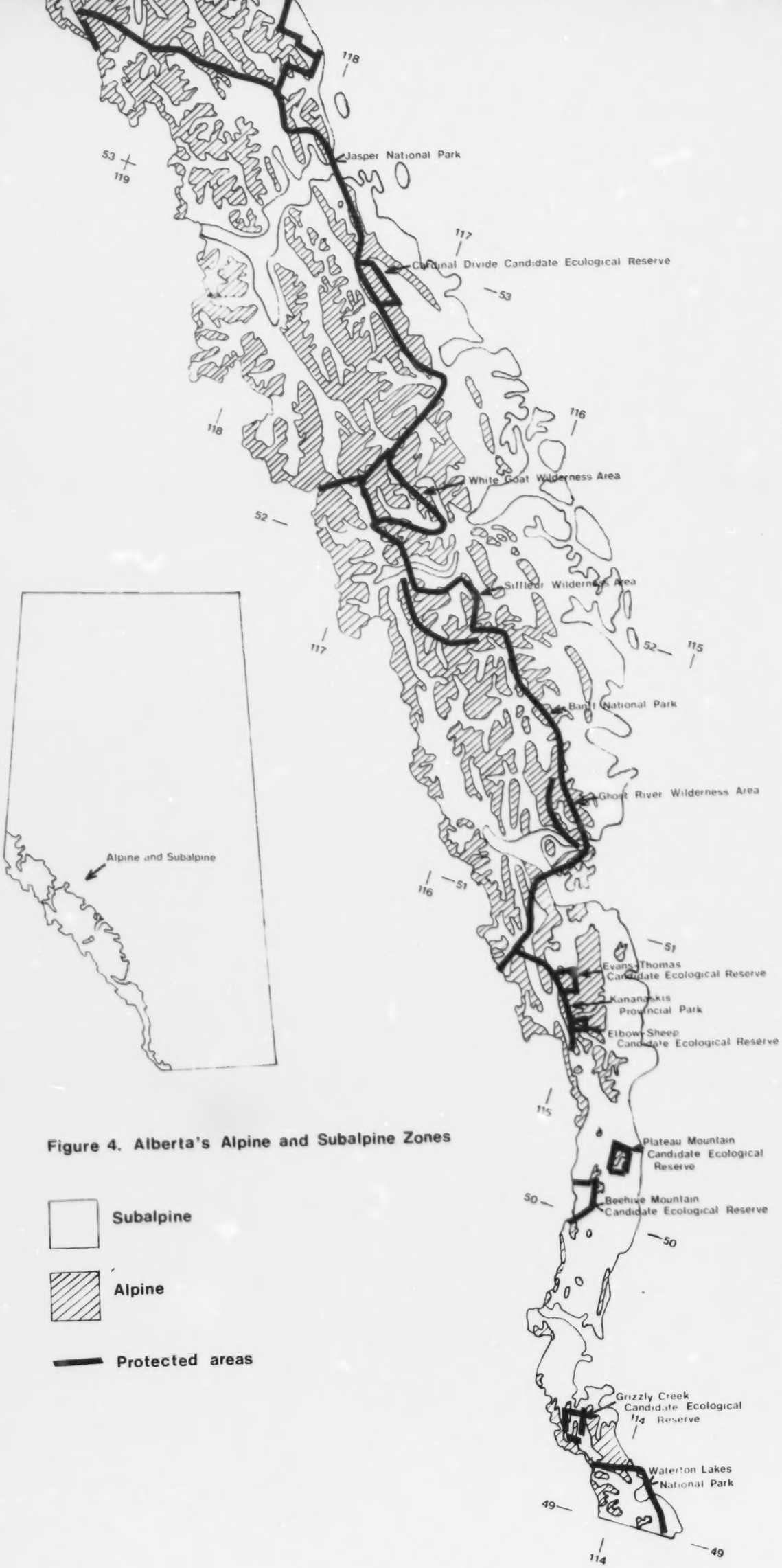


Figure 4. Alberta's Alpine and Subalpine Zones

Kananaskis Provincial Park contains many floristic and vegetational elements not found in the two Wilderness Areas. Notable examples are the presence of larch forests, understory vegetation dominated by false azalea and rhododendron and rich herblands (e.g. meadow rue and tufted hairgrass communities) (Kondla 1978).

The vegetation of Banff and Jasper National Parks, and of White Goat and Siffleur Wilderness Areas, is very similar. Banff and Jasper National Parks do have several alpine and upper subalpine vegetation types which are not yet reported for the White Goat and Siffleur Wilderness Areas (Achuff and Corns 1981). However, most of these types occur in the moister and less craggy western Main Ranges (in which the two Wilderness Areas are not located) or in the southern subalpine zone (i.e. south Banff Park). For example, the Phyllodoce glanduliflora - Cassiope mertensiana - Antennaria lanata vegetation type is a prevalent alpine type in Banff/Jasper, but rarely occurs in the two Wilderness Areas. Also, larch forests and those forests in which rhododendron and false azalea are important understory plants are abundant in the southern subalpine but have not been reported as understory dominants in the two Wilderness Areas. The remaining Banff/Jasper alpine and subalpine types may yet be reported for the Wilderness Areas on further investigation.

The two Wilderness Areas also contain a few community types which have not been reported for either Banff or Jasper (e.g. Picea engelmannii/Salix drummondiana, Phylldoce glanduliflora/Salix spp. - Antennaria lanata and the Salix nivalis - Carex nigricans cts.). The disparities may be attributable to different researchers having different approaches to the collection and organization of phytosociological data. However, there do seem to be some real vegetation differences, for example the abundance of the Phyllodoce glanduliflora/Salix spp. - Antennaria lanata type in the alpine and the Picea engelmannii/Salix drummondiana type on subalpine alluvial flats in the Wilderness Areas.

The Ghost River Wilderness Area is located in the southern Front Ranges, resulting in some floristic and vegetational differences. For example, the Ghost contains calciophiles such as Smelowskia calycina and

Phacelia sericea, which are not generally found or at least are not as common in the White Goat and Siffleur. Southern Rocky Mountain species occurring in the Ghost, but not yet reported for the White Goat or Siffleur, include Arnica longifolia and Larix lyallii (Brathay Exploration Group 1981). Important vegetational differences include the dominance of Arctostaphylos uva-ursi on many dry alpine and upper subalpine slopes. This is common in many Front Range locations (Johnson 1975, Achuff and Corns 1981).

Little work has been done on Willmore Wilderness Park, although the area has both Main Range and Front Range elements.

CANDIDATE ECOLOGICAL RESERVES

All of the candidate Ecological Reserves (i.e. Beehive Mountain, Plateau Mountain, Upper Evans-Thomas, Elbow-Sheep Divide, and Cardinal River Divide) occur in the Front Ranges and consequently have some important vegetational and floristic differences from the White Goat and Siffleur. Floristically, the Front Ranges, because of the predominance of calcareous bedrock, have many calciophile plants not generally found in the Main Ranges (i.e. Smelowskia calycina, Carex rupestris, Phacelia sericea, Saxifraga flagellaris, etc.).

Plateau Mountain has as its main features, an ice cave and the finest and most extensive examples of permafrost associated polygons and stone nets in the province.

Beehive Mountain is on the border of the southern Rockies floristic and vegetational zone as identified by Kuchar (1973) and Ogilvie (1962). This candidate Ecological Reserve contains many floristic and vegetation elements of that southern zone, notably abundant herbaceous tundra, as compared to heath tundra common in the two Wilderness Areas. Beehive also has whitebark pine and larch forests and important understory species, such as false azalea and rhododendron, which are either absent or unimportant in the White Goat and Siffleur.

The candidate Elbow-Sheep Divide Ecological Reserve has upper subalpine wet meadows and shallow lakes which are more extensive than any found in the two wilderness areas, although the vegetation types found in both areas are similar.

Upper Evans-Thomas contains elements of the drier Front Ranges, but also has elements of the southern Rocky Mountains.

Cardinal River Divide has extensive areas covered by Dryas integrifolia tundra, which becomes less prominent in the Main Ranges and the Southern Rockies. This site also has some interesting patterned ground features and extensive mesic herbaceous alpine areas not found on the study sites in the two wilderness areas.

There are some gaps in the information required to make an assessment of the entire Alpine and Subalpine Zones in Alberta. These gaps include the Kakwa area and Willmore Wilderness Park in the north, an area between and including the Ram River and the Ghost River Wilderness Area in the central Rockies, and the area between Crowsnest Pass and Waterton National Park in the southern Rockies.

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APPENDIX 1

LOCATION OF THE WHITE GOAT AND SIFFLEUR

WILDERNESS AREAS

White Goat Wilderness Area

The boundaries of White Goat Wilderness Area are described in the Revised Statutes of Alberta, Book 7, Page 6757. From a point on the boundary of Banff National Park, just north of Sunset Pass, the south border essentially follows the north embankment of the Cline River. Approximately one mile upstream from the confluence of Coral Creek and the Cline River, the boundary swings north and west. It follows the height of land dividing Coral Creek and McDonald Creek watersheds, then the northeast boundary of the McDonald Creek watershed to Mt. McDonald. From Mt. McDonald, the border essentially heads west to where it intersects the boundary of Jasper National Park. It then follows the boundary of the park back to the point of commencement.

Ridges east of McDonald Creek belong to the First Range. The eastern boundary of White Goat Wilderness Area follows along the ridgetops, at heights of 2,438 m to 3,018 m (8,000 feet to 9,900 feet). Mt. McDonald forms the northern boundary of the area (elevation 3,151 m - 10,338 feet). Mt. Stewart (elevation 3,315 m - 10,869 feet) is between McDonald and Cataract Creeks, and is the highest point in White Goat Wilderness Area. Cline Pass separates Mt. Stewart from Afternoon Peak (elevation 2,880 m - 9,450 feet).

The west border of the area follows along the eastern boundary of Jasper and Banff National Parks. This boundary is along the height of land, and its average elevation is approximately 2,743 m (9,000 feet). Both Cataract Pass (approximate elevation 2,438 m - 8,000 feet) and Cirrus Mountain (elevation 3,216 m - 10,550 feet) are intersected by this boundary.

There are several small glaciers within White Goat Wilderness Area, mainly along this west border. Most are unnamed, however Huntington Glacier is near the headwaters of Huntington Creek, on the southeast facing slope of Cirrus Mountain.

The lowest point in White Goat Wilderness Area is (approximately 1,464 m - 4,800 feet) at the southeastern boundary along the Cline River.

Siffleur Wilderness Area

Siffleur Wilderness Area is bounded on the west and south by Banff National Park. At Ram River Glacier, the border heads north, bisecting the glacier. This eastern border then follows the height of land marking the eastern border of Escarpment and Siffleur River drainages to a point in township 35, range 17, where there is a break in the ridge. This point is adjacent to where a tributary joins the Siffleur River, approximately 7 km upstream from the North Saskatchewan River. The boundary then heads west, crossing the Siffleur River just downstream from where the tributary joins it. Then the boundary heads south along the west bank of the Siffleur River, to the height of land just east of Loudon Creek. From here, the border swings west and follows the height of land to the boundary of Banff National Park.

The area is bissected by the Siffleur River. Both the Escarpment River and Porcupine Creek drain into the Siffleur River, and their watersheds are within the boundaries of the wilderness area. Loudon Creek, Spreading Creek and Corona Creek all drain directly into the North Saskatchewan River. They are all crossed by the northern boundary of the Siffleur Wilderness Area and, in each case, only varying proportions of the headwaters are within the boundaries of the area.

The eastern boundary of Siffleur Wilderness Area follows ridgetops dividing the Siffleur River and White Rabbit Creek drainages. The southeastern corner of the area includes a small portion of the Ram River Glacier on Nordic Ridge. Midway along this series of ridgetops is an unnamed peak that reaches an elevation of 3,167 m (10,390 feet); however, the peaks are generally between 2,438 m and 2,743 m (8,000 feet and 9,000 feet).

The lowest point in the area is along the Siffleur River, in the northernmost portion of the area, elevation 1,464 m (4,800 feet).

The northern boundary of the area crosses Loudon, Spreading and Corona Creeks, and falls on the flanks of several ridges, including Siffleur Mountain (elevation 3,129 m - 10,266 feet), Mt. Loudon (3,221 m - 10,566 feet) and Corona Ridge. The highest named peak in the Siffleur Wilderness Area is Mt. Loudon at 3,221 m (10,566 feet).

The western border follows the boundary of Banff National Park, along the top of the ridge just west of Corona Creek. Most of this ridge is unnamed, except for Totem Tower, at the headwaters of Spreading Creek.

The southern border of Siffleur Wilderness Area also follows the boundary of Banff National Park, along the height of land containing the Porcupine Creek Watershed, crosses the Siffleur River, and again follows the height of land, this time containing the Escarpment River watershed. Along this border there are several small glaciers, but only one, the Ram River Glacier, is named. Along this border, between Mt. Kentigern and Icefall Mountain, is a 3,358 m (11,010 feet) unnamed peak. This is the highest point in the Siffleur Wilderness Area.

APPENDIX 2

ANNOTATED LIST OF VASCULAR PLANTS

A total of 329 species of vascular plants are included in the following list. Taxonomy is generally according to Moss (1959) and Hitchcock and Cronquist (1973).

"W" refers to the specimen being recorded for the White Goat Wilderness Area, and "S" is for the Siffleur Wilderness Area. Numerous collections were made and were deposited in the following herbaria: University of Alberta (ALTA), National Museum (CAN), Agriculture Canada (DAO), Provincial Museum of Alberta (PMAE), Alberta Department of Energy and Natural Resources, and the University of Toronto.

OPHIOGLOSSACEAE

Botrychium lanceolatum (Gmelin) Rupr. var. lanceolatum J. - W and S, uncommon, subalpine grassy slopes (ALTA, CAN)

Botrychium lunaria (L.) SW. - S and W, occasional, subalpine grassy slopes, mesic shrublands (ALTA, CAN, PMAE, DAO)

POLYPODIACEAE

Asplenium viride Huds. - W, occasional, subalpine boulder field (ALTA, CAN, PMAE)

Cystopteris fragilis (L.) Bernh. - S and W, frequent, alpine and subalpine rocky areas (ALTA, CAN, PMAE, DAO)

Woodsia scopulina D.C. Eat. - S, uncommon, subalpine boulder field (ALTA, CAN, PMAE, DAO)

EQUISETACEAE

Equisetum arvense L. - W and S, common, alpine and subalpine mesic areas (ALTA, CAN, PMAE, DAO)

Equisetum scirpoides Michx. - W and S, common, alpine and subalpine (ALTA, CAN)

Equisetum variegatum Schleich. - W and S, occasional, alpine and subalpine mesic areas (ALTA, CAN, PMAE, DAO)

LYCOPODIACEAE

Lycopodium alpinum L. - W, occasional, subalpine meadow (ALTA, CAN)

Lycopodium annotinum L. - W and S, occasional, coniferous - feathermoss forests, subalpine scrub (ALTA, CAN, PMAE)

Lycopodium clavatum L. - S, occasional, dry pine forests (ALTA)

Lycopodium complanatum L. - W and S, occasional, spruce fir forests, dry pine forests (ALTA, CAN)

Lycopodium selago L. - S, locally common, spruce - pine forests (ALTA, CAN)

SELAGINELLIACEAE

Selaginella densa Rydb. - W and S, frequent, alpine (ALTA)

Selaginella rupestris (L.) Spring - W, frequent, alpine (ALTA)

PINACEAE

Abies lasiocarpa (Hook.) Nutt. - W and S, dominant forest species (ALTA)

Picea engelmannii Parry - W and S, dominant forest species

Picea glauca (Moench) Voss - W and S, abundant at lower elevations (ALTA)

Pinus albicaulis Engelm. - W, scarce, timberline (ALTA)

Pinus contorta Dougl. ex Loud. - W and S, abundant forest species (ALTA)

CUPPRESSACEAE

Juniperus communis L. - W and S, common, open slopes in alpine and subalpine

Juniperus horizontalis Moench. - W and S, frequent, slopes

JUNCAGINACEAE

Triglochin palustris L. - S, occasional, wet sedge meadow (ALTA)

GRAMINEAE

Agropyron latiglume (Scirbn. and Smith) Rydb. - W and S, common, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Agrostis scabra Willd. - S, occasional, subalpine meadow (ALTA)

Bromus pumpellianus Scirbn. - W and S, frequent, pine slope, mesic shrub slope, spruce fir forest (ALTA, CAN, PMAE)

Calamagrostis canadense (Michx.) Beauv. - W and S, occasional, mesic shrubland (ALTA, CAN)

Calamagrostis inexpansa A. Gray - W and S, occasional, mesic spruce - fir forests, mesic shrublands (ALTA, CAN)

Calamagrostis purpurescens R. Br. - W and S, frequent, dry pine forests, dry subalpine grassland, alpine heath community (ALTA, CAN, PMAE, DAO)

Danthonia intermedia Vassey - W and S, frequent, open pine - shrub community, open dry willow type (ALTA, CAN, PMAE, DAO)

Deschampsia atropurpurea (Wahlenb.) Scheele - S, uncommon, mesic subalpine shrubland (ALTA)

Deschampsia caespitosa (L.) Beauv. - W and S, frequent, mesic alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Elymus innovatus Beal. - W and S, abundant species on open slopes (ALTA, CAN, PMAE, DAO)

Festuca baffinensis Polunin - W, frequent, alpine and subalpine (ALTA)

Festuca brachyphylla Schultes = F. ovina L. var. brevifolia (R. Br.) Wats. - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Festuca saximontana Rydb. - W and S, occasional, dry areas in alpine and subalpine (ALTA, CAN, PMAE, DAO)

Hierochloe alpina (Sw.) Roem. and Schult., J. - W, scarce, dry alpine (ALTA, CAN)

Hierochloe odorata (L.) Beauv. - W, occasional, fir - heath subalpine forest (ALTA, CAN)

Phleum alpinum L. - W and S, frequent, alpine areas (ALTA, CAN, PMAE, DAO)

Poa alpina L. - W and S, common, alpine areas (ALTA, CAN, PMAE, DAO)

Poa arctica R. Br. = P. grayana Vasey - W and S, common, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Poa glauca Vahl. - W, scarce, alpine (ALTA)

Poa interior Rydb. - W and S, subalpine grassy slopes, spruce - willow flats (ALTA, CAN, PMAE)

Poa longipila Nash. J - W and S, occasional, alpine and subalpine mesic shrublands (ALTA, CAN, PMAE)

Poa nervosa (Hook.) Vasey - W and S, alpine and subalpine open areas (ALTA, CAN, PMAE, DAO)

Poa pratensis L. - W, scarce, upper subalpine opening (ALTA)

Trisetum spicatum (L.) Richt. - W and S, widespread alpine species (ALTA, CAN, PMAE, DAO)

CYPERACEAE

Carex albo-nigra Mack. - W and S, common, dry alpine, scree (ALTA, CAN, PMAE, DAO)

Carex aquatilis Wahlenb. - W and S, frequent, wet areas (ALTA, CAN, PMAE, DAO)

Carex atrosquama Mack. = C. atrata L. - W and S, frequent, mesic alpine and in subalpine spruce - willow forest (ALTA, CAN, PMAE, DAO)

Carex aurea Nutt. - W, scarce, mesic subalpine willow (ALTA, CAN)

Carex capillaris L. var. elongata Olney - W and S, frequent, wet subalpine meadows and shrublands (ALTA, CAN, PMAE, DAO)

Carex concinna R. Br. - W and S, mesic spruce - pine forests and shrublands (ALTA, CAN, PMAE, DAO)

Carex drummondiana Dewey = C. rupestris All. - W and S, frequent, dry alpine (ALTA, CAN, PMAE, DAO)

*Carex festivella Mack. B. - reported only by Brathay Exploration Group

Carex garberi Fern. var. bifaria Fern. - W and S, open gravel flats (ALTA, CAN)

Carex gymnoclada Holm. - W, scarce, moist alpine (ALTA)

Carex gynocrates Wormsk. - W and S, occasional, mesic shrubland (ALTA, CAN)

Carex incondita F.J. Hermann - W, occasional, dryas alpine tundra (ALTA, CAN, PMAE, DAO)

Carex maclovina D'Urv. - W and S, occasional, subalpine shrublands (ALTA, CAN, PMAE, DAO)

Carex media R. Br. - W and S, occasional, subalpine shrublands (ALTA, CAN)

Carex microglochin Wahlenb. - W, scarce, calcareous wetlands (ALTA)

Carex nardina E. Fries - W and S, common to abundant, dry alpine areas (ALTA, CAN, PMAE, DAO)

Carex nigricans C.A. Meyer - W and S, locally common, mesic alpine seepage areas (ALTA, CAN, PMAE, DAO)

Carex phaeocephala Piper - W and S, common, alpine scree areas and subalpine steep grassy slopes (ALTA, CAN, PMAE, DAO)

Carex physocarpa Presl. - W and S, uncommon, wet meadows (ALTA, CAN)

Carex praticola Rydb. - S, occasional, open spruce flats (ALTA)

Carex pyrenaica Wahlenb. - W and S, occasional, alpine streamside (ALTA, CAN)

Carex richardsonii R. Br. - W, scarce, dry, open pine - juniper forest (ALTA)

Carex scirpoides Michx. - W and S, abundant, dryas tundra (ALTA, CAN, PMAE, DAO)

Carex spectabilis Dewey = C. tolmiei Boott - W and S, occasional, mesic alpine shrublands, meadows and krummholtz area (ALTA, CAN)

Carex umbellata Schk. - S, rare, alpine (ALTA)

Carex vaginata Tausch - W and S, occasional, wet subalpine meadow and forests (ALTA, CAN)

Eleocharis pauciflora (Lightf.) Link var. fernaldii Svenson - S, wet subalpine meadow (ALTA, CAN)

Eriophorum angustifolium Honckeny - W, occasional, wet alpine areas (ALTA, CAN)

Eriophorum brachyantherum Trautv. - W and S, occasional, mesic alpine and subalpine shrublands (ALTA, CAN, PMAE)

Eriophorum chamaissonis C.A. Mey. - W, uncommon, mesic alpine areas (ALTA, CAN)

Eriophorum scheuzeri Hoppe - W, rare, mesic alpine (ALTA)

Eriophorum vaginatum L. ssp. spissum (Fern.) Hulten - W, uncommon, mesic alpine and subalpine sites (ALTA)

Eriophorum viridi-carinatum (Engelm.) Fern. - W, uncommon, mesic subalpine shrublands (ALTA)

Kobresia myosuroides (Vill.) Fiori and Paol. = K. bellardii (All.) Degl. - W and S, common, dry alpine (ALTA, CAN, PMAE, DAO)

Kobresia simpliciuscula (Wahlenb.) Mack. - W and S, frequent, subalpine wet meadows and flats (ALTA, CAN, PMAE, DAO)

Scirpus caespitosa L. var. callosue Bigel. - W and S, occasional, wet alpine - subalpine areas (ALTA, CAN)

Scirpus pumilis Vahl. spp. rollandii (Fern.) Raymond - W, uncommon, wet alpine and subalpine sites (ALTA)

JUNCACEAE

Juncus albescens (Lange) Fern. = J. triglumis L. - W and S, common, wet to mesic alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Juncus balticus Willd. - W and S, common, mesic subalpine shrublands (ALTA, CAN)

Juncus castaneus J.E. Smith - W and S, occasional, wet to mesic alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Juncus drummondii E. Meyer - W and S, frequent, mesic alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Juncus ensifolius Wikstr. - W, rare, mesic alpine (ALTA)

Juncus parryi Englem. - W, uncommon, mesic alpine (ALTA)

Luzula glabrata (Hoppe) Desv. = L. hitchockii Hamet-Ahti, B. - W, uncommon, mesic alpine meadow (ALTA)

Luzula parviflora (Ehrh.) Desv. - W and S, common, alpine areas (ALTA, CAN, PMAE, DAO)

Luzula spicata (L.) DC. - W and S, common, alpine areas (ALTA, CAN, PMAE, DAO)

Luzula wahlenbergii Rupr. - W and S, common, alpine areas (ALTA, CAN, PMAE, DAO)

LILIACEAE

Stenanthium occidentale A. Gray - S, uncommon, spruce - fir forest (ALTA)

Tofieldia pusilla (Michx.) Pers. - W and S, uncommon, mesic subalpine shrublands (ALTA, CAN)

Veratrum escholtzii A. Gray - S, uncommon, mesic subalpine slope (ALTA)

Zygadenus elegans Purch. - W and S, frequent, dry south-facing subalpine slopes

ORCHIDACEAE

Habenaria hyperborea (L.) R. Br. - W and S, occasional, mesic alpine and subalpine shrublands (ALTA, CAN)

SALICACEAE

Salix arctica Pall. - W and S, common, alpine (ALTA, CAN, PMAE, DAO)

Salix barklayi Anderss. - W and S, occasional, subalpine willow flats (ALTA, PMAE, DAO)

Salix barrattiana Hook. - W and S, dominant alpine and upper subalpine shrub in mesic areas (ALTA, PMAE, DAO)

Salix brachycarpa Nutt. - W and S, uncommon, subalpine forests (ALTA, PMAE, DAO)

Salix drummondiana Barratt. - W and S, locally dominant, subalpine river flats (ALTA, CAN, PMAE, DAO)

Salix farrae Ball - W and S, locally common, alpine and subalpine mesic shrublands (ALTA, CAN, PMAE, DAO)

Salix glauca L. - W and S, dominant alpine shrub and abundant in subalpine shrubland (ALTA, CAN, PMAE, DAO)

Salix nivalis Hook. = S. reticulata L. var. nivalis (Hook.) And. - W and S, dominant, alpine sites (ALTA, PMAE, DAO)

Salix vestita Pursh. - W and S, common, spruce - shrub - feathermoss forest (ALTA, DAO)

BETULACEAE

Betula glandulosa Michx. - W and S, dominant, some alpine and subalpine shrublands (ALTA, CAN)

Betula pumila var. glanduliflora Regal. B. - W and S, common, alpine and subalpine shrublands (ALTA)

POLYGONACEAE

Eriogonum androsaceum Benth. - W, occasional, alpine rock scree (ALTA, CAN)

*Eriogonum ovalifolium Nutt. - W, reported only by Brathay Exploration Group

Eriogonum subalpinum Greene - W, rare on alpine rock scree (ALTA)

Oxyria digyna (L.) Hill - W and S, common, wet-mesic alpine sites - especially along streams (ALTA, CAN, PMAE)

Polygonum viviparum L. - W and S, common throughout alpine (ALTA, CAN, PMAE, DAO)

Rumex alpestris (Scop.) Love - W and S, occasional, alpine meadows (ALTA, CAN, PMAE, DAO)

PORTULACEAE

Claytonia lanceolata Pursh. - locally common, mesic alpine sites (ALTA, CAN)

Claytonia megarrhiza (A. Gray) Parry - W and S, locally frequent, alpine rock scree (ALTA, CAN, PMAE)

CARYOPHYLLACEAE

Arenaria obtusiloba (Rydb.) Fern. - W and S, occasional, alpine areas (ALTA, CAN, PMAE, DAO)

Arenaria rossii R. Br. - W and S, scarce, alpine areas (ALTA, CAN)

Arenaria rubella (Wahlenb.) J.E. Smith - W, rare, alpine areas (ALTA, CAN)

Cerastium arvense L. - W and S, frequent, dry subalpine shrublands (ALTA, CAN, PMAE, DAO)

Cerastium beeringianum Cham. and Schlect. - W and S, occasional, alpine scree (ALTA, CAN, PMAE, DAO)

Cerastium brachypodium (Engelm.) Robins - S, uncommon, alpine areas (ALTA)

Silene acaulis L. - W and S, uncommon, alpine scree (ALTA)

Silene parryi (S. Wats.) C.L. Hitchc. and Maguire - W and S, occasional, alpine scree (ALTA, CAN, PMAE, DAO)

Stellaria calycantha (Ledeb.) Bong. - S, uncommon, moist alpine (ALTA, CAN)

Stellaria longifolia Muhl. - W, occasional, mesic alpine (ALTA, CAN)

Stellaria longipes Goldie - W, common, mesic alpine and subalpine (ALTA, CAN, PMAE, DAO)

Stellaria monantha Hulten - W and S, uncommon, alpine slopes (ALTA, CAN, PMAE, DAO)

RANUNCULACEAE

Anemone drummondii S. Wats. - W and S, common, alpine (ALTA, CAN, PMAE)

Anemone multifida Poir. - W and S, frequent, dry alpine and subalpine areas (ALTA, CAN, PMAE)

Anemone narcissiflora L. - W, rare, alpine (ALTA)

Anemone occidentalis S. Wats. - W, common, alpine (ALTA, CAN)

Anemone parviflora Michx. - W and S, common, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Aquilegia flavescens S. Wats. - W and S, occasional, alpine scree and rock ledges (ALTA, CAN, PMAE, DAO)

Caltha leptosepala DC. - W and S, locally common, mesic-wet alpine (ALTA, CAN)

Delphinium bicolor Nutt. DC. - W, rare, subalpine forest

Delphinium glaucum S. Wats. - W and S, occasional, subalpine mesic shrublands (ALTA, CAN)

Ranunculus cardiophyllus Hook. - W, uncommon, mesic subalpine shrublands

Ranunculus escholtzii Schlecht. - W and S, locally abundant, wet to mesic alpine (ALTA, CAN, PMAE, DAO)

Ranunculus occidentalis Nutt. - W, unknown collection site

Ranunculus pedatifidus J.E. Smith var. affinis (R. Br.) L. Benson - W, uncommon, mesic alpine (ALTA, CAN)

Ranunculus pygmaeus Wahlenb. - W and S, uncommon, mesic alpine (ALTA, CAN)

Ranunculus verecundus B.L. Robins - W, rare, mesic alpine (ALTA, CAN)

Trollius albiflorus (G. Gray) Rydb. - W and S, locally common, mesic alpine (ALTA)

PAPAVERACEAE

Papaver kluanensis D. Love - W, rare, dry alpine ridgetops (ALTA, CAN, PMAE)

CRUCIFERAE

Arabis drummondii A. Gray - W and S, common, alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Arabis hirsuta (L.) Scop. - W, uncommon, open upper subalpine spruce forest (ALTA)

Arabis lemmonii S. Wats. - W, rare, alpine (ALTA)

Arabis lyallii S. Wats. - W, occasional, mesic alpine and subalpine shrublands (ALTA)

Barbarea orthoceras Leadeb. - S, uncommon, mesic subalpine spruce forest (ALTA)

Braya glabella Richards - S, uncommon, subalpine gravel flats (ALTA)

Cardamine bellidifolia Greene - S, uncommon, subalpine spruce forest (ALTA)

Cardamine umbellata Greene - S, uncommon, unknown subalpine site

Descuriana richardsonii (Sweet) O.E. Schulz - W, uncommon, dry alpine slope (ALTA)

Draba aurea Vahl. - W and S, occasional, steep subalpine grassy slopes and alpine areas (ALTA, CAN, PMAE)

Draba borealis DC. - W and S, uncommon, subalpine shrublands (ALTA, CAN, PMAE)

Draba cana Rydb. = D. lanceolata Royle - W, occasional, subalpine spruce - pine flats and alpine areas (ALTA, CAN, PMAE)

Draba crassifolia R. Grah. - W, alpine (ALTA)

Draba incerta Payson - W and S, occasional, alpine (ALTA, CAN, PMAE)

Draba lonchocarpa Rydb. - W and S, occasional, alpine sites (ALTA, CAN, PMAE)

Draba macounii O.E. Schulz - W, rare, alpine sites (ALTA, CAN)

Draba nivalis Liljebl. - W, common, mesic alpine slopes (CAN)

Draba paysonii Macbr. - W, uncommon, alpine (ALTA, CAN)

Draba stenoloba Ledeb. - W and S, alpine (ALTA, CAN)

Draba stenopetala Trautv. - W, rare, alpine (ALTA, CAN)

Draba ventosa A. Gray - W, uncommon, alpine (ALTA, CAN)

Erysimum pallasii (Pursh.) Fern. - W, scarce, alpine (ALTA)

CRASSULACEAE

Sedum stenopetalum Pursh. = S. lanceolatum Torr. - W and S, common, alpine and upper subalpine (ALTA, CAN, PMAE, DAO)

SAXIFRAGACEAE

*Leptarrhena pyrifolia (D. Don) R. Br. - W, reported only by Brathay Exploration Group

Mitella nuda L. - W and S, common, subalpine forests and shrublands (ALTA)

Parnassia fimbriata Konig - W and S, frequent, mesic alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Parnassia kotzebuei Cham. and Schl. - W and S, occasional, mesic alpine and subalpine sites (ALTA, CAN, PMAE, DAO)

Parnassia palustris L. var. neogaea Fern. - S, common, river gravel flats (ALTA)

Ribes lacustre (Pers.) Poir. - W and S, uncommon, mesic subalpine shrublands (ALTA, CAN)

Ribes oxyacanthoides L. - W and S, uncommon, spruce forests (ALTA)

Saxifraga adscendens L. - W and S, occasional, mesic alpine scree (ALTA, CAN, PMAE, DAO)

Saxifraga aizoides L. - W and S, locally abundant, river gravels (ALTA, CAN, PMAE, DAO)

Saxifraga bronchialis L. - W and S, occasional, alpine scree (ALTA, CAN, PMAE, DAO)

Saxifraga caespitosa L. - W and S, occasional, alpine (ALTA, CAN, PMAE, DAO)

Saxifraga cernua L. - W and S, occasional, alpine scree (ALTA, CAN)

Saxifraga debilis Engelm. - S. rivularis L. - W and S, mesic alpine seepage sites (ALTA, CAN)

Saxifraga ferruginea Graham - W, rare, mesic alpine (ALTA)

Saxifraga hirculus L. - W, rare, alpine (ALTA)

Saxifraga lyallii Engler. - W and S, frequent, mesic alpine and subalpine forests (ALTA, CAN, PMAE, DAO)

Saxifraga occidentalis S. Wats. - W and S, uncommon, mesic alpine (ALTA, CAN)

Saxifraga oppositifolia L. - W and S, occasional, mesic alpine (ALTA, CAN, PMAE, DAO)

ROSACEAE

Dryas drummondii Richards - W and S, locally dominant, riverbank gravels (ALTA, CAN, PMAE)

Dryas octopetala L. var. hookeriana (Juz.) Breit. - W and S, dominant, alpine (ALTA, CAN)

Dryas integrifolia M. Vahl. - W and S, occasional, dominant, alpine (ALTA, CAN)

Fragaria virginiana Duchesne var. glauca S. Wats. - W and S, common, alpine shrublands and subalpine forests and shrublands (ALTA)

*Luetkea pectinata (Pursh) Kuntze - W, reported only by Brathay Exploration Group

Potentilla diversifolia Lehm. - W and S, common, mesic alpine (ALTA, CAN, PMAE, DAO)

Potentilla fruticosa L. - W and S, frequent, subalpine shrublands (ALTA)

Potentilla glandulosa Lindl. spp. pseudorupestris (Rydb.) Keck - W, scarce, alpine scree (ALTA)

Potentilla hyparctica Malte - W and S, occasional, alpine (ALTA, CAN, PMAE, DAO)

Potentilla nivea L. spp. nivea - W and S, common, alpine (ALTA, CAN, PMAE, DAO)

Potentilla pensylvanica L. - W, uncommon, alpine (ALTA)

Potentilla villosa Pall. ex Pursh - W, uncommon, alpine (ALTA)

Rosa acicularis Lindl. - W and S, common, subalpine forests and shrublands (ALTA, CAN)

Rubus acaulis Lindl. - W and S, frequent, subalpine spruce forests

Rubus strigosus Michx. J. - W and S, frequent, subalpine spruce forests (ALTA, CAN)

Sibbaldia procumbens L. - W and S, frequent, mesic alpine and subalpine (ALTA, CAN, PMAE, DAO)

LEGUMINOSAE

*Astragalus aboriginum Richards - W, reported only by Brathay Exploration Group

Astragalus alpinus L. - W and S, common, alpine (ALTA, CAN, PMAE, DAO)

Astragalus frigidus (L.) A. Gray var. americanus (Hook.) S. Wats. - W and S, occasional, alpine and subalpine shrublands and forests (ALTA, CAN, PMAE)

Astragalus occidentalis (S. Wats.) M.E. Jones - W and S, frequent, alpine and subalpine mesic shrublands and riverbank gravels (ALTA, CAN, PMAE, DAO)

Astragalus vexilliflexus Sheld. - W, scarce, alpine slopes (ALTA, CAN)

Hedysarum alpinum L. - W and S, frequent, alpine shrublands and upper subalpine (ALTA, CAN, PMAE, DAO)

Hedysarum mackenzii Richards. - W and S, frequent, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Hedysarum sulphurescens Rydb. B. - W, occasional, open spruce forest (ALTA)

Oxytropis campestris (L.) DC. - W and S, common, alpine (ALTA, CAN, PMAE, DAO)

Oxytropis podocarpa A. Gray - W and S, common, alpine (ALTA, CAN)

*Oxytropis sericea Nutt. var. spicata (Hook.) Barneby - W, reported only by Brathay Exploration Group

Oxytropis splendens Dougl. ex Hook. - W, alpine and subalpine graminoid slopes (ALTA, CAN)

EMPETRACEAE

Empetrum nigrum L. - W and S, locally abundant, spruce - pine forests (ALTA, CAN)

VIOLACEAE

Viola adunca J.E. Smith - W and S, frequent, mesic alpine and subalpine (ALTA, CAN, PMAE)

ELAEAGNACEAE

Shepherdia canadensis (L.) Nutt. - W and S, common, pine forests (ALTA)

ONAGRACEAE

Epilobium alpinum L. - W and S, occasional, mesic alpine and timberline (ALTA, CAN)

Epilobium angustifolium L. - W and S, occasional, subalpine shrublands and slopes

Epilobium clavatum Trel. J. - W and S, occasional, alpine (ALTA, CAN, PMAE)

Epilobium hornemannii Reichenb. - W, alpine seepage areas (ALTA, CAN)

Epilobium latifolium L. - W and S, locally abundant, riverbank gravels, alpine mesic scree (ALTA, CAN, PMAE, DAO)

Epilobium palustre L. - W and S, occasional, wet subalpine sedge meadows and shrublands (ALTA)

Epilobium platyphyllum Rydb. - W, rare, alpine streambank (ALTA)

UMBELLIFERAE

Heracleum lanatum Michx. - W and S, mesic alpine and subalpine open areas (ALTA)

Osmorhiza depauperata Philippi - S, uncommon, alpine sites (ALTA, CAN)

CORNACEAE

Cornus canadensis L. - W and S, common, forests (ALTA)

PYROLACEAE

Monesis uniflora (L.) A. Gray - W and S, common, spruce forests (ALTA, CAN, PMAE, DAO)

Pyrola asarifolia Michx. - W and S, common, spruce forests (ALTA, CAN, PMAE, DAO)

Pyrola minor L. - W and S, common, spruce forests (ALTA, CAN, PMAE, DAO)

Pyrola secunda L. - W and S, occasional, spruce forests (ALTA, CAN)

Pyrola virens Schweigg. - W, uncommon, pine - juniper forest (ALTA, CAN)

ERICACEAE

Arctostaphylos rubra (Rehder and Wils.) Fern. - W and S, uncommon, alpine slope (ALTA)

Arctostaphylos uva-ursi (L.) Spreng. - W and S, locally abundant, dry alpine slopes and dry subalpine forested slopes (ALTA, CAN)

Cassiope mertensiana (Bong.) D. Don - W and S, locally abundant, mesic alpine and subalpine forests (ALTA, CAN, PMAE, DAO)

Cassiope tetragona (L.) D. Don ssp. saxamontana (Small) Porsild - W and S, abundant, mesic alpine and subalpine forests

Kalmia polifolia Wang. var. microphylla (Hook.) Rehd. - W and S, occasional, mesic alpine (ALTA, CAN, PMAE, DAO)

Ledum groenlandicum Oeder - W and S, frequent, mesic alpine and subalpine areas (ALTA, CAN)

Menziesia glabella A. Gray - S, rare, spruce - fir forest (ALTA)

Phyllodoce empetriformis (Smith) D. Don - W and S, occasional, mesic alpine and timberline (ALTA)

Phyllodoce intermedia (Hook.) Camp - W and S, occasional, mesic open upper subalpine (ALTA, CAN)

Phyllodoce glanduliflora (Hook.) Coville - W and S, abundant, alpine and upper forests (ALTA, CAN, PMAE, DAO)

Rhododendron albiflorum Hook. - W, rare, spruce forests (ALTA, CAN)

Vaccinium caespitosum Michx. - W and S, common, mesic alpine, open timberline areas, shrublands (ALTA, CAN)

Vaccinium membranaceum Dougl. - S, uncommon, spruce - fir forests (ALTA, CAN)

Vaccinium myrtillus L. - W, uncommon, spruce - fir forests (ALTA)

Vaccinium scoparium Leiberg - W and S, abundant, spruce - fir forests (ALTA, CAN, PMAE, DAO)

Vaccinium vitis-idaea L. var. minus Lodd. - W and S, frequent, mesic mossy forests

PRIMULACEAE

Androsace chamaejasme Host - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Androsace septentrionalis L. - W and S, occasional, dry subalpine sites (ALTA, CAN, PMAE)

Dodecatheon conjugens Greene - W and S, occasional, dry alpine and subalpine open areas (ALTA, CAN)

Primula egalikensis Wormskj. - W, rare, spruce - pine creek edge (ALTA)

GENTIANACEAE

Gentiana amarella (L.) Borner - W and S, occasional, pine - juniper slopes, subalpine grassy slopes (ALTA, CAN)

Gentiana glauca Pallas - W and S, rare, spruce forests (ALTA, CAN)

Gentiana propinqua Richards. - W and S, frequent, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Gentiana prostrata Haenke var. americana Engelm. - W and S, occasional, alpine mesic shrublands

POLEMONIACEAE

Polemonium viscosum Nutt. - W, rare, alpine ridges (ALTA, CAN)

HYDROPHYLLACEAE

Phacelia sericea (Graham) A. Gray - W and S, occasional, alpine scree (ALTA, CAN, PMAE, DAO)

Romanzoffia sitchensis Bong. - W and S, uncommon, wet alpine rocks (ALTA, CAN)

BORAGINACEAE

Mertensia paniculata (Ait.) G. Don - W and S, occasional, subalpine streambank (ALTA)

Myosotis alpestris Schmidt - W and S, frequent, alpine slopes (ALTA, CAN, PMAE)

SCROPHULARIACEAE

Castilleja miniata Dougl. - W and S, common, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Castilleja occidentalis Torr. - W and S, common, alpine (ALTA, CAN, PMAE, DAO)

Castilleja rhexifolia Rydb. B. - W and S, occasional, subalpine open areas (ALTA, CAN, PMAE)

Castilleja septentrionalis Lindl. - S, rare, subalpine riverbank gravels (ALTA)

Pedicularis arctica R. Br. = P. langsdorfii Fisch. spp. arctica (R.Br.) Pennell - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Pedicularis bracteosa Benth. - W and S, common, subalpine spruce forests (ALTA, CAN, PMAE, DAO)

Pedicularis flammea L. - W, rare, alpine (ALTA)

Pedicularis groenlandica Retz. - W and S, locally common, wet to mesic alpine and subalpine sites (ALTA, CAN, PMAE)

Penstemon ellipticus Coult. and Fisher - W and S, occasional, subalpine rock scree (ALTA, CAN)

Penstemon procerus Dcugl. - W and S, occasional, alpine and subalpine open slopes (ALTA, CAN, PMAE, DAO)

Veronica alpina L. var. unalaschensis Coult. and Schult. - W and S, common, mesic alpine (ALTA, CAN, PMAE, DAO)

CAPRIFOLIACEAE

Linnaea borealis L. var. americana (Forbes) Rehd. - W and S, common, subalpine forests

VALERIANACEAE

Valeriana sitchensis Bong. - W and S, common, mesic alpine and subalpine areas (ALTA, CAN)

CAMPANULACEAE

Campanula lasiocarpa Cham. - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Campanula rotundifolia L. - W and S, frequent, alpine and subalpine (ALTA, CAN)

Campanula uniflora L. - W, uncommon, alpine (ALTA)

COMPOSITAE

Achillea millefolium L. - W and S, common, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Agoseris aurantiaca (Hook.) Greene - W and S, occasional, alpine and subalpine (ALTA, PMAE, DAO)

Agoseris glauca (Pursh) Raf. var. dasycephala (T. & G.) Jeps. - W and S, common, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Antennaria alpina (L.) Gaertn. var. media (Greene) Jeps. - W and S, frequent, alpine and upper subalpine (ALTA, CAN, PMAE, DAO)

Antennaria lanata (Hook.) Greene - W and S, frequent, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Antennaria neglecta Greene - W and S, uncommon, alpine and spruce - pine forests (ALTA, CAN)

Antennaria nitida Greene - W and S, dry alpine slopes and dry open forest (ALTA, CAN, PMAE, DAO)

Antennaria pulcherrima (Hook.) Greene - S, occasional, mesic subalpine open shrubland

Antennaria racemosa Hook. - W, occasional, mesic spruce - fir forest (ALTA, CAN, PMAE, DAO)

Antennaria rosea Greene - W and S, dry alpine and subalpine slopes (ALTA, CAN, PMAE, DAO)

Antennaria umbrinella Rydb. - W and S, dryas tundra and subalpine rocky slopes (ALTA, CAN, PMAE, DAO)

Arnica alpina (L.) Olin - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Arnica cordifolia Hook. - W and S, frequent, spruce forests (ALTA, CAN, PMAE)

Arnica diversifolia Greene - W and S, frequent, mesic alpine heath and shrubland (ALTA, CAN, PMAE, DAO)

Arnica fulgens Pursh - W, scarce, mesic spruce - moss forest (ALTA)

Arnica latifolia Bong. - W and S, frequent, spruce - fir slopes (ALTA, CAN, PMAE, DAO)

Arnica louiseana Farr - W and S, occasional, alpine (ALTA, CAN)

Arnica mollis Hook. - W, uncommon, mesic alpine shrubland (ALTA)

Arnica rydbergii Greene - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Artemesia norvegica Fries - W, frequent, mesic alpine and mesic spruce - fir open forests (ALTA, CAN, PMAE, DAO)

Aster alpinus L. - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)
Aster foliaceous Lindl. var. parryi (D.C. Eat.) Gray - S, rare, wet subalpine meadow (ALTA)

Aster sibiricus L. - W and S, occasional, alpine and subalpine (ALTA, CAN, PMAE, DAO)

Cirsium hookerianum Nutt. - W and S, occasional, alpine scree (ALTA, CAN)

Crepis elegans Hook. - S, uncommon, riverbank gravels (ALTA)

Crepis nana Richards. - W and S, frequent, alpine and subalpine scree and colluvium (ALTA, CAN, PMAE, DAO)

Erigeron acris L. - W and S, frequent, mesic alpine and subalpine shrubland and scree (ALTA, CAN, PMAE, DAO)

Erigeron aureus Greene - W and S, common, alpine (ALTA, CAN, PMAE, DAO)

Erigeron compositus Pursh - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Erigeron grandiflorus Hook. - W, rare, high alpine (ALTA)

Erigeron humilus Grah. - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Erigeron lanatus Hook. - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

*Erigeron pallens Cronq. - W, reported only by Brathay Exploration Group

Erigeron peregrinus (Pursh) Greene - W and S, common, mesic alpine and open areas in upper subalpine (ALTA, CAN, PMAE, DAO)

Erigeron uncialis Blake, J. - W, occasional, dry alpine (ALTA, CAN, PMAE, DAO)

Haplopappus lyallii A. Gray - W and S, frequent, alpine (ALTA, CAN, PMAE)

Hieracium gracile Hook. - W and S, occasional, alpine and spruce - fir forests (ALTA, CAN, PMAE, DAO)

Petasites palmatus (Ait.) A. Gray - W and S, frequent, forests

Petasites frigidus (L.) Fries. - W and S, uncommon, alpine streamsides (ALTA)

Saussurea densa (Hook.) Rydb. - W and S, occasional, alpine and subalpine scree slopes (ALTA, CAN, PMAE, DAO)

Senecio cymbalarioides Nutt. = S. debilis Nutt. - W and S, occasional, pine - juniper forest, dry gravel subalpine shrubland

Senecio freemontii Torr. and A. Gray - W and S, frequent, alpine (ALTA, CAN, PMAE, DAO)

Senecio indecorus Greene - W and S, occasional, mesic alpine and subalpine shrubland

Senecio lugens Richards. - S, occasional, mesic subalpine shrublands (ALTA, CAN, PMAE, DAO)

Senecio pauciflorus Pursh - W and S, frequent, mesic alpine (ALTA, CAN, PMAE, DAO)

Senecio triangularis Hook. - W and S, frequent, mesic alpine and subalpine shrublands (ALTA, CAN, PMAE, DAO)

Solidago multiradiata Ait. - W and S, common, alpine and upper subalpine (ALTA, CAN, PMAE, DAO)

Taraxacum ceratophorum (Ledeb.) DC. - W and S, uncommon, mesic alpine and subalpine (ALTA, CAN)

Taraxacum lyratum (Ledeb.) DC. - W and S, frequent, mesic alpine and upper subalpine (ALTA, CAN, PMAE, DAO)

Taraxacum officinale Weber - S, uncommon, subalpine clearing (ALTA)

*Reported only the the Brathay Exploration Group (1980)

NON-VASCULARS

Atrichum selwynii Aust.
Aulocomnium palustre (Hedw.) Schwaegr.
Blepharostoma trichophyllum A.
Brachythecium groenlandicum
Brachythecium starkei (Brid.)
Brachythecium turgidum (Hartm.) Kindb.
Bryum pseudotriquetrum (Hedw.) Gaertn.
Bryum weigellii Spreng.
Campyllium stellatum (Hedw.) C. Jens.
Ceratodon purpureus (Hedw.) Brid.
Cetraria cucullata (Bell.) Ach.
Cetraria nivalis (L.) Ach.
Cetraria tilesii Ach.
Chandonenthus setiformis A.
Clevea hyalina = Athalamia hyalina (Sommert.) Hatt.
Cratoneuron commutatum (Hedw.) Roth
Cladina mitis Sandst.
Cladonia chlorophaea (Flk.) Spreng.
Cladonia pyxidata (L.) Hoffm.
Cladonia uncialis (L.) Wigg.
Dicranum acutifolium (Lindb. and Arn.) C. Jens.
Dicranum brevifolium var. brevifolium
Dicranum fuscescens Turn.
Dicranum scoparium Hedw.
Dicranoweisia crispula (Hedw.) Milde.
Distichum capillaceum (Hedw.) B.S.G.
Ditrichum flexicaule (Schwaegr.) Hampe.
Drepanocladus revolvens (Sw.) Warnst.
Drepanocladus sendtneri (Schimp.) Warnst.
Drepanocladus uncinatus (Hedw.) Warnst.
Encalypta alpina Sm.
Encalypta procera Bruch.

Grimmia affinis Hornsch.
Hylocomium splendens (Hedw.) B.S.G.
Hypnum recurvatum
Hypnum revolutum (Mitt.) Lindb.
Lophozia floerkia
Lophozia hatcheri
Lophozia lycopodioides
Lophozia polita
Myurella tenerrimum (Brid.) Lindb.
Myurella julacea (Schwaegr.) B.S.G.
Nephroma arcticum
Paludella squarrosa (Hedw.) Brid.
Peltigera aphthosa (L.) Willd.
Peltigera canina
Philonotis fontana (Hedw.) Brid.
Plagiopus oederiana (Brid.) Limpr.
Pleurozium shreberi (Brid.) Mitt.
Pohlia nutans (Hedw.) Lindb.
Polhia proligera (Kindb.) Lindb. ex. H. Arnell
Polytrichum juniperinum Hedw.
Polytrichum piliferum Hedw.
Psoroma hypnorum
Rhacomitrium canescens (Hedw.) Brid.
Rhacomitrium heterostichum var. occidentale (Hedw.)
Solorina bispora Nyl.
Solorina crocea (L.) Ach.
Solorina octospora Arn.
Sphagnum warnstorfii Russ.
Splachnum sphaericum Hedw.
Steriocaulon sp.
Tetraplodon mnioides (Hedw.) B.S.G.
Tomenthypnum nitens (Hedw.) Loeske
Tortula norvegica (Web.) Wahlenb. ex. Lindb.
Umbilicaria virginis Schaer.

APPENDIX 3

PLANT COMMUNITY DESCRIPTIONS

CLOSED FOREST

1. Pinus contorta/Juniperus communis/Arctostaphylos uva-ursi - Elymus innovatus (Pine/juniper/bearberry - hairy wild rye)

This type is reported for both wilderness areas and occurs on dry, sunny, steep slopes of southerly or westerly aspects.

Pinus contorta dominates the tree layer (60% cover) while Picea engelmannii has low cover (< 5%). Juniperus communis is the dominant shrub (20%) followed by the dwarf-shrub Arctostaphylos uva-ursi (10%). The cover of Elymus innovatus averages 20%. Other plants that contribute significantly to the cover of one or the other of the two sampled stands are Hedysarum alpinum, Shepherdia canadensis and Zygadenus elegans. Other plants common to both sites include Linnaea borealis, Rosa aciculatis and Solidago multiradiata.

This type is very similar to the Pinus contorta/Juniperus communis/Arctostaphylos uva-ursi vegetation type of Banff/Jasper except that the type described for the wilderness areas has higher cover of Elymus innovatus.

2. Picea engelmannii - Pinus contorta/Phyllodoce glanduliflora - Empetrum nigrum/moss-lichen (Spruce-pine/yellow heath - crowberry/moss/lichen

Three stands of this community type were sampled in the White Goat Wilderness and this type probably occurs in the Siffleur as well, under similar physical conditions. All three stands occurred on gentle slopes (<10%) and on subxeric to mesic sites.

Picea engelmannii is the dominant tree (20% cover) with lesser amounts of Pinus contorta (<10%). The shrub layer is composed of regenerating trees (including Abies lasiocarpa) and Phyllodoce

glanduliflora and Empetrum nigrum have moderate cover of about 20% each. Other characteristic vascular species are Anemone parviflora, Arctostaphylos uva-ursi, Arnica cordifolia, Cassiope tetragona, Elymus innovatus, Ledum groenlandicum, Salix glauca, Salix vestita, Solidago multiradiata and Vaccinium scoparium. Bryoids have a total cover value of about 25% and are dominated by either lichens (especially Cladonia mitis and other Cladonia spp.) or mosses (especially Hylocomium splendens).

This type is similar to the Pinus contorta -(Picea engelmannii)/Empetrum nigrum/Cladonia mitis vegetation type of Banff/Jasper except that the wilderness areas type appears moister.

3. Picea engelmannii - Abies lasiocarpa/Phyllodoce glanduliflora - Vaccinium scoparium/moss (Spruce - fir/yellow heath/grouseberry/moss)

This closed forest community type is reported for both wilderness areas on moderately steep to steep slopes (20-35^{0}) of easterly aspects.

The tree layer is closed and averages about 25% cover. Picea engelmannii was the dominant tree in three stands and Abies lasiocarpa in one stand. These communities appeared very mature (average diameter at breast height of the Picea engelmannii in two stands is 23 cm). The stands had moderate to dense regeneration of Abies lasiocarpa. The cover of Phyllodoce glanduliflora is dense (average of 11%) and Vaccinium scoparium averages 21%. Other characteristic plants include Arnica cordifolia, Astragalus alpinus, Elymus innovatus, Erigeron peregrinus, Pedicularis bracteosa, Salix glauca and Salix vestita. Bryoid cover is very high, averaging about 70% and is dominated by both Hylocomium splendens and Pleurozium shreberi.

This type is very similar to the Picea engelmannii - Abies lasiocarpa/Phyllodoce glanduliflora/Hylocomium splendens type of Banff/Jasper.

4. Pinus contorta - Picea engelmannii/Elymus innovatus/moss (Pine - spruce/hairy wild rye/moss)

This community is reported only once for the White Goat Wilderness and occupied a gentle slope.

Pinus contorta and Picea engelmannii each have cover values of about 20%. Juniperus communis and Salix glauca are the dominant shrubs but had low total cover (5%). Elymus innovatus is the dominant herb (10%). Other important understory plants are Arnica cordifolia, Juniperus communis, Linnaea borealis and Salix glauca. Bryoid cover exceeded 50% and was composed of both Hylocomium splendens and Pleurozium shreberi.

This community is similar to the Picea engelmannii - Abies lasiocarpa/Elymus innovatus - Arnica cordifolia - Linnaea borealis/Hylocomium splendens vegetation type of Banff/Jasper except that Pinus contorta was the dominant tree in the wilderness areas.

5. Pinus contorta - Picea engelmannii/Salix glauca/Elymus innovatus (Pine - spruce/willow/hairy wild rye)

This community type is reported for both the White Goat and Siffleur Wilderness Areas and occupied moderate slopes (15-20^{0}).

Pinus contorta is the dominant tree, followed by Picea engelmannii. Salix glauca has an average cover of 12% for the two stands sampled and Elymus innovatus averages 20%. Other plants common to the two stands are Antennaria rosea, Arctostaphylos uva-ursi, Astragalus alpinus, Epilobium angustifolium, Festuca saximontana, Gentianella propinqua, Juniperus communis, Poa nervosa, Solidago multiradiata and Trisetum spicatum.

This type is somewhat similar to the Picea engelmannii - Pinus contorta/Salix glauca/Elymus innovatus type reported for Banff/Jasper.

6. Picea engelmannii - Abies lasiocarpa/Equisetum arvense (Spruce - fir/horsetail)

This spruce-fir/horsetail forest community is reported only once from the Siffleur Wilderness and occupied gently sloping terrain adjacent to a stream.

The forest canopy is only light in density (about 12%). Equisetum arvense has a high cover of about 40%. Other important species include Arctostaphylos uva-ursi, Erigeron peregrinus, Senecio lugens, Shepherdia canadensis and Solidago multiradiata.

This community is very similar to the Picea engelmannii/Equisetum arvense/Hylocomium splendens type of Banff/Jasper.

7. Abies lasiocarpa - Picea engelmannii/moss (Fir - spruce/moss)

This community was semi-quantified twice in the Siffleur Wilderness. Both stands occupied gently sloping sites.

The tree canopy has a cover value of about 40%. Picea engelmannii was dominant in one stand and Abies lasiocarpa in the other. Abies lasiocarpa has high regeneration (40%) in one stand. Shrubs and herbs have low cover but species common to both stands include Lycopodium annotinum, Mitella nuda, Pyrola minor and Vaccinium scoparium. Bryoid cover is very high (>85%), dominated by Hylocomium splendens and Pleurozium shreberi with small amounts of Ptilium crista-castrensis.

This type is very similar to the Picea engelmannii - Abies lasiocarpa/Hylocomium splendens vegetation type of Banff/Jasper.

8. Picea engelmannii - Abies lasiocarpa/Salix vestita/Cassiope tetragona (Spruce - fir/willow/white mountain heather)

This community type is reported for both wilderness areas and occupied moderate to steep slopes of northerly aspects.

The tree canopy is dominated by Picea engelmannii and Abies lasiocarpa (total cover of about 25%). Salix vestita and Cassiope tetragona are the dominant shrubs (10% and 15% cover respectively). Other species common to both stands include Anemone parviflora, Dryas octopetala, Ledum groenlandicum, Lycopodium selago, Phyllodoce glanduliflora, Salix glauca, Solidago multiradiata and Vaccinium scoparium. Bryoid cover is fairly high, averaging 40%, and is dominated by Pleurozium shreberi and Hylocomium splendens.

This type is very similar to the Picea engelmannii - Abies lasiocarpa/Salix vestita/Cassiope tetragona vegetation type of Banff/Jasper.

OPEN FOREST

1. *Picea engelmannii/Salix glauca - Shepherdia canadensis/Elymus innovatus* (Spruce/willow - buffaloberry/hairy wild rye)

Only one stand was semi-quantified from the Siffleur Wilderness. The community occupied a fairly large 20^{0} northwest facing slope.

Picea engelmannii is the dominant tree and *Salix glauca* the dominant shrub (20% cover). *Shepherdia canadensis* has high cover of 10% and *Elymus innovatus* 10%. Other important species include *Arctostaphylos uva-ursi*, *Dryas octopetala* and *Pinus contorta*.

This community is very similar to the *Picea engelmannii - Abies lasiocarpa/Salix glauca/Elymus innovatus* type of Banff/Jasper except that *Abies lasiocarpa* was absent and *Shepherdia canadensis* has high cover in the wilderness areas stand.

2. *Picea engelmannii/Salix drummondiana* (Spruce/willow)

This type is reported for both the White Goat and Siffleur Wilderness Areas and occurs on alluvial flats adjacent to streams.

Picea engelmannii is the dominant tree. There are a large number of shrub species present but both stands were dominated by *Salix drummondiana* (average cover of about 30%), but *Salix vestita*, *Shepherdia canadensis* and *Salix farrae* are important in one or the other stands. Other common species include *Arctostaphylos rubra*, *Equisetum scirpoides*, *Gentianella propinqua*, *Hedysarum alpinum*, *Poa alpina* and *Zygadenus elegans*.

No other comparable vegetation types have been described in Banff/Jasper nor elsewhere in the Alberta Rocky Mountains Subalpine Zone.

3. Abies lasiocarpa - Picea engelmannii/Phyllodoce glanduliflora - Cassiope spp. - Vaccinium scoparium (Fir - spruce/yellow heath - white mountain heather - grouseberry)

Four stands of this type were sampled in both wilderness areas. Slopes vary from 5^0 to 35^0 and all types faced north.

Abies lasiocarpa is the dominant tree at 12% cover followed by Picea engelmannii (<10%). There is a high cover of Abies lasiocarpa regeneration (< 25%). Phyllodoce glanduliflora and Cassiope tetragona or C. mertensiana have fairly high cover of 30% and 15% respectively. Vaccinium scoparium is also an important understory plant (6%). Salix arctica is important in two of the stands. Other characteristic species include Antennaria lanata, Castilleja rhexifolia, Erigeron peregrinus, Pedicularis bracteosa, Potentilla diversifolia and Salix nivalis. Bryoid cover is high and one stand had Barbilophozia lycopodioides and Dicranum scoparium covers of about 65%.

This type is very similar to the Picea engelmannii - Abies lasiocarpa/Phyllodoce glanduliflora - Cassiope mertensiana vegetation type of Banff/Jasper except that in the wilderness areas, Abies lasiocarpa was the dominant tree and Cassiope mertensiana was instead replaced by Cassiope tetragona.

4. Abies lasiocarpa/Valeriana sitchensis (Fir/valerian)

This community was reported only once in the Siffleur and consisted of tree islands amongst alpine and upper subalpine low shrub-heath communities.

Abies lasiocarpa is the dominant tree and also the dominant shrub. Valeriana sitchensis has a cover of about 10%. Other important species include Erigeron peregrinus and Vaccinium scoparium.

This type is similar to the Picea engelmannii, Abies lasiocarpa/Valeriana sitchensis - Erigeron peregrinus vegetation type of Banff/Jasper except that in the wilderness areas, Picea engelmannii was not present.

5. Picea engelmannii - Abies lasiocarpa/Salix vestita/Arctostaphylos rubra (Spruce - fir/willow/bearberry)

This community was only reported once in the White Goat and occupied a small area on a 20^{0} northeast facing slope.

Picea engelmannii and Abies lasiocarpa together cover less than 15%. Salix vestita is the dominant shrub at 20% and Arctostaphylos rubra has a cover of 10%. Another important species is Betula glandulosa.

This type is similar to the Picea engelmannii - Abies lasiocarpa/Salix vestita/Arctostaphylos rubra vegetation type of Banff/Jasper.

SHRUB

1. Salix glauca/Elymus innovatus - Solidago multiradiata (Willow/hairy wild rye - goldenrod)

This community type is described from four locations in both the White Goat and Siffleur on various slopes (8^{0} to 30^{0}) of southerly and westerly aspects.

Salix glauca is the dominant shrub with very high cover (>50%) although other shrubs occasionally become important (i.e. Potentilla fruticosa, Salix barrattiana, Salix farrae). Elymus innovatus and Solidago multiradiata dominate the understory (35% and >15% respectively). Other common species include Achillea millefolium, Antennaria nitida, Astragalus alpinus, Fragaria virginiana, Potentilla diversifolia and Trisetum spicatum.

This community type is similar to the Salix glauca/Elymus innovatus vegetation type of Banff/Jasper except that Solidago multiradiata is not reported as an important species in Banff/Jasper for this type.

2. Salix glauca/Danthonia intermedia (Willow/timber oat grass)

This community was sampled only once in the White Goat.

Salix glauca is the dominant shrub but has fairly low cover (10%). Danthonia intermedia is the dominant understory plant (10%). Other important species include Abies lasiocarpa, Agoseris glauca, Elymus innovatus, Juniperus communis and Vaccinium myrtillus.

This community is only somewhat similar to the Salix glauca/Danthonia intermedia type of Banff/Jasper except that the wilderness areas community seems drier and has different subdominants.

3. Abies lasiocarpa - Salix glauca (Fir - willow)

This community was sampled once in the White Goat and occupied a steep sloping (30^{0}) south-facing slope.

Abies lasiocarpa is the dominant shrub (65%) and Salix glauca an important subdominant (10%). Other important species are Arctostaphylos uva-ursi, Arnica cordifolia and Epilobium angustifolium.

This type is similar to the Abies lasiocarpa - Salix spp. vegetation type of Banff/Jasper.

4. Salix glauca/Fragaria virginiana - Kobresia myosuroides (Willow/strawberry - sedge)

The Salix glauca/Kobresia myosuroides community is only reported once from the White Goat from a gently sloping site on an alluvial landform adjacent to a stream.

Shrub cover is high (about 50%) with Salix glauca being dominant (>20%). Kobresia myosuroides is the dominant understory plant but has low cover. Other important plants are Antennaria lanata, Hedysarum alpinum, Picea engelmannii and Salix nivalis.

This community is somewhat similar to the Betula glandulosa - Salix glauca/Kobresia myosuroides vegetation type of Banff/Jasper except that Betula glandulosa was not important in the wilderness areas community.

5. Salix spp. - Betula glandulosa/Phyllodoce glanduliflora (Willow - dwarf birch/yellow heath)

This type was sampled once and reported several times in the White Goat where it covered large expanses of alpine areas.

Salix glauca is most often the dominant shrub but is often in association with or replaced by Salix barrattiana in moister sites (total cover of over 50%). Betula glandulosa and Phyllodoce glanduliflora also have high cover (40% each). Other important plants are Arctostaphylos uva-ursi and Artemesia norvegica.

This community type somewhat resembles the Salix spp. - Betula glandulosa/Erigeron peregrinus vegetation type of Banff/Jasper except that Phyllodoce glanduliflora is not reported as an important species.

6. Salix barrattiana/Salix nivalis (Willow/dwarf willow)

This community type was semi-quantified six times in the two wilderness areas and usually occupied gently sloping sites.

Salix barrattiana is the dominant shrub with high cover (about 35%) and Salix nivalis the dominant dwarf shrub (average cover of 7%). Other plants that occasionally become important are Arctostaphylos rubra, Carex albo-nigra, Cassiope tetragona, Dryas octopetala, Equisetum arvense, Phyllodoce glanduliflora and Trollius albiflorus. Other common plants include Anemone parviflora, Antennaria lanata, Carex scirpoides, Dryas octopetala, Phyllodoce glanduliflora, Polygonum viviparum, Potentilla diversifolia, Solidago multiradiata and Veronica alpina.

This type is similar to the Salix barrattiana/Potentilla diversifolia vegetation type of Banff/Jasper.

7. Salix spp. - Betula spp. - Potentilla fruticosa/Carex capillaris - Tomenthypnum nitens (Willow - dwarf birch - cinquefoil/sedge - moss)

This type is reported from eight stands in both wilderness areas and occurred in moist, gently sloping sites.

Shrub cover is very high, averaging about 70% with Salix spp. contributing the most (Salix barrattiana 17%, S. glauca 6%, and S. drummondiana and S. farrae each less than 5%). Betula glandulosa and Potentilla fruticosa also have moderate cover (18% and 15% respectively). Salix nivalis is the dominant dwarf shrub (12%). Carex capillaris is the dominant herb (about 20%). The bryoid layer has very high cover and is dominated by Tomenthypnum nitens (50%) but Aulocomnium palustre, Drepanocladus revolvens and Campylium stellatum are also important. Other vascular plants that occasionally become importnt are Carex aquatilis, Carex atrosquama, Equisetum scirpoides, Juncus albescens, Kobresia simpliciuscula, Phyllodoce glanduliflora, Polygonum viviparum, Solidago parviflora, Arctostaphylos rubra, Deschampsia caespitosa, Erigeron peregrinus, Hedysarum alpinum, Pedicularis groenlandica, Petasites vitifolius, Picea engelmannii, Poa alpina, Potentilla diversifolia, Rubus acaulis and Senecio indecorus.

This type is very similar to the Betula spp. - Potentilla fruticosa - Salix glauca/Tomenthypnum nitens vegetation type of Banff/Jasper.

LOW SHRUB-HERB

1. *Arctostaphylos uva-ursi/Salix glauca* (Bearberry/willow)

This type is described from two locations in the White Goat and both communities occupied steep (>35°) south-facing slopes. This type probably occurs frequently in both wilderness areas in similar physical environments.

Although *Arctostaphylos uva-ursi* and *Salix glauca* are dominant, together they occupy less than 15% of the cover. Bare ground and rocks occupied over 50% of the ground surface. Other species common to both stands include *Achillea millefolium*, *Antennaria lanata*, *Astragalus alpinus*, *Elymus innovatus*, *Erigeron aureus*, *Fragaria virginiana*, *Gentianella propinqua* and *Potentilla pensylvanica*.

This community type seems to be somewhat similar to the *Juniperus communis - Salix glauca* vegetation type recognized in Banff/Jasper (Achuff and Corns 1981). The type reported for the wilderness areas may be a variant of the Banff/Jasper type.

2. *Cassiope tetragona - Dryas octopetala (integrifolia) - Salix nivalis* (White mountain heather - mountain avens - willow)

This community type occurs frequently in both wilderness areas and was sampled in two locations and reported for six other locations. All of the communities occurred on northerly or easterly aspects with slopes ranging from 10° to 20°. This type is often located between the drier *Dryas octopetala - Salix nivalis* type and the moister *Phyllodoce glanduliflora/Salix nivalis - S. arctica - Antennaria lanata* type.

For the two stands sampled, Cassiope tetragona and Dryas spp. each had average covers of 30% while Salix nivalis averaged 40%. Other characteristic species include Astragalus alpinus, Cerastium arvense, Erigeron aureus, Fragaria virginiana, Pedicularis arctica, Poa arctica, Polygonum viviparum, Potentilla hyparctica, P. diversifolia, Salix arctica and Silene acaulis.

3. Phyllodoce glanduliflora/Salix spp. - Antennaria lanata (Yellow heath/willow/pussytoes)

This type is very common and widespread in the White Goat. The eight communities described occupied various aspects except westerly and occupied slopes of 0^{o} to 20^{o}.

Total heath cover is 10% to 70% and averages about 40%. Salix arctica and Salix nivalis together occupy about 20%. Antennaria lanata is a characteristic subdominant (5%). Other species that may occasionally have high cover are Artemesia norvegica and Dryas octopetala. Other frequently occurring species include Castilleja occidentalis, Erigeron aureus, Poa alpina, Potentilla diversifolia, Sibbaldia procumbens and Veronica alpina. Exposed soil and rock have a high coverage.

In Banff/Jasper, this type is very similar in habitat and species composition to their Phyllodoce glanduliflora - Cassiope mertensiana - Antennaria lanata vegetation type with one important exception; the lack of Cassiope mertensiana. This species apparently decreased greatly in importance towards the Front Ranges. Several other studies from the Front Ranges report the absence of Cassiope mertensiana as an important species in the Phyllodoce glanduliflora communities. The community type reported here may be a legitimate "noda" and "association". Cassiope mertensiana does not appear to have an ecological equivalent in this type in the Front Ranges. There seems only to be an increase in the cover of Phyllodoce glanduliflora.

Two interesting possible subtypes of this community type are the Salix glauca/Phyllodoce glanduliflora - Antennaria lanata community which covered a large area in the upper reaches of the alpine basin at upper McDonald Creek, White Goat Wilderness, and the Phyllodoce glanduliflora - Cassiope tetragona - Salix arctica subtype which is reported for two sizeable areas in the White Goat (neither of these communities were quantified).

4. Phyllodoce glanduliflora - Cassiope mertensiana - Trollius albiflorus (Yellow heath - white mountain heather - globe flower)

This community was only reported once in the Siffleur Wilderness Area (at upper Escarpment Creek) and occupies a moderately sized (1 ha) 20^{0} east-facing slope.

In the one stand which was semi-quantified, Phyllodoce glanduliflora is dominant (40%) followed by the subdominants Cassiope mertensiana (20%) and Trollius albiflorus (10%). Other important species include Antennaria lanata, Salix arctica and Salix nivalis.

Although this community is similar to the Main Ranges vegetation type Phyllodoce glanduliflora - Cassiope mertensiana - Antennaria lanata as reported for Banff/Jasper, Cassiope mertensiana decreases greatly in cover in the Front Ranges where it is unusual to find this vegetation type.

5. Salix arctica - Antennaria lanata (Willow - pussytoes)

This community is only reported once for the White Goat and was not quantified. It was a very small community and was located on a 5^{0} easterly-facing slope.

These two species had about a 20% cover each and an important subdominant was Senecio triangularis.

This community is probably very similar to the *Salix arctica* - *Potentilla diversifolia* vegetation type reported for Banff/Jasper.

HERB-DWARF SHRUB

1. Dryas octopetala - Kobresia myosuroides (Mountain avens - sedge)

This community type is reported from three sites in the White Goat and Siffleur and probably occurs occasionally, occupying relatively small areas on moderate slopes ($< 10^{0}$) of southerly aspects.

Dryas octopetala is the dominant plant (20%) followed by Kobresia myosuroides (12%). Other plants common to both sites include Poa alpina and Trisetum spicatum.

This type is very similar to the Dryas octopetala - Kobresia myosuroides - Arctostaphylos uva-ursi vegetation type of Banff/Jasper except that Arctostaphylos uva-ursi only occurred in one stand in the wilderness areas.

2. Dryas octopetala - Salix nivalis - Salix arctica (Mountain avens - willow)

Four stands of the community type were semi-quantified in the White Goat, and several more were reported. All sites were on a northerly or easterly aspect and slope averaged 20^{0}.

Plant cover averages less than 50% of the ground surface. Dryas octopetala is the dominant plant (25%) while Salix nivalis and Salix arctica are the important subdominants but have fairly low cover (5% and $<$ 5% respectively). Other common species include Astragalas alpinus, Cassiope tetragona, Haplopappus lyallii, Luzula spicata, Poa alpina and Trisetum spicatum.

This type is quite similar to the Dryas octopetala - Salix nivalis - Silene acaulis type of Banff/Jasper except that Silene

acaulis was not important in the wilderness areas and Salix arctica was not important in Banff/Jasper.

3. Elymus innovatus - Juniperus communis - Arctostaphylos uva-ursi (Hairy wild rye - juniper - bearberry)

Two stands of this type were sampled in the Siffleur Wilderness and both stands occupied a 25^{0} to 30^{0} south-facing slope. This type probably occurs occasionally in both wilderness areas in similar environments.

Elymus innovatus has high cover in both communities (40%). Juniperus communis and Arctostaphylos uva-ursi are the most important subdominants (average cover of 12% and 10% respectively). Other species that become important in one or the other stand are Shepherdia canadensis and Trisetum spicatum. Important species that are common to both stands are Abies lasiocarpa, Achillea millefolium, Epilobium angustifolium, Erigeron peregrinus, Festuca saximontana, Fragaria virginiana, Gentianella propinqua, Ledum groenlandicum, Picea engelmannii, Poa interior, Poa nervosa, Salix glauca, Sedum stenopetalum, Solidago multiradiata, Vaccinium caespitosum and Vaccinium scoparium.

This type is very similar to the Elymus innovatus - Epilobium angustifolium vegetation of Banff/Jasper.

4. Dryas drummondii/Salix brachycarpa (drummondiana) - (Mountain avens/willow)

Only one site was quantified in the Siffleur Wilderness Area although several others were reported from level to gently sloping sites, usually on fluvial landforms.

Vegetation covered less than 60% of the ground surface. Dryas drummondii is the dominant plant (20%). Salix spp. cover about 50% of the ground surface and includes mainly Salix brachycarpa and S. drummondiana but also includes S. farrae and S. glauca. Other important species are Picea engelmannii, Arctostaphylos uva-ursi, Hedysarum mackenzii and Hedysarum alpinum.

This stand is similar to the Dryas drummondii - Epilobium latifolium vegetation type described for Banff/Jasper.

5. Scree Slopes

These slopes are very common on all aspects and usually have steep slopes (20^{o}). There is little or no soil development, but moisture seems abundant even though drainage is rapid through the coarse scree.

Vascular plant cover is usually much less than 10%. Species which occurred in at least three of the four stands sampled include Crepis nana, Epilobium latifolium, Dryas octopetala, Oxyria digyna, Saussaurea densa, Erigeron aurea, Trisetum spicatum and Poa alpina.

6. Salix nivalis - Carex nigricans (Willow - sedge)

This type occurs periodically but is of small size in both wilderness areas. The communities occupied a variety of slopes and aspects.

Salix nivalis is by far the most dominant species and averages about 40% of the ground cover, whereas Carex nigricans averages under 10%. This type is somewhat difficult to characterize because the various communities do not seem to be homongeneous. However, from the five stands for which data was collected, characteristic or important species include Anemone parviflora, Antennaria lanata, Carex capillaris, Equisetum scirpoides, Juncus drummondii, Polygonum

viviparum, Potentilla diversifolia, Solidago multiradiata and Trisetum spicatum.

This community type is not described for Banff/Jasper but has some similarities to the Carex nigricans - Antennaria lanata vegetation type. Other authors have recognized a Salix nivalis type elsewhere in the Alberta Rocky Mountains.

7. Carex nigricans - Ranunculus escholtzii (Sedge - buttercup)

This type is reported for the Siffleur Wilderness and probably occurs occasionally in very mesic areas but is not areally extensive.

Of the two stands sampled, Carex nigricans was clearly dominant (35%) and Ranunculus escholtzii the subdominant (5%). Other important species include Antennaria lanata, Juncus drummondii, Poa alpina, Potentilla diversifolia and Sibbaldia procumbens.

This community type is very similar to the Carex nigricans - Antennaria lanata vegetation type reported for Banff/Jasper, especially the moister site subtype in which Ranunculus escholtzii becomes important.

8. Caltha leptosepala (Mountain marigold)

Areas dominated by Caltha leptosepala were occasionally reported but were never sufficiently homogeneous or large to sample semi-quantitatively. They occurred on very moist sites on gentle slopes. One site on which notes were taken have the following species: Caltha leptosepala, Cassiope mertensiana, Kalmia polifolia, Trisetum spicatum, Juncus drummondii, Salix arctica and Trollius albiflorus.

These areas are very similar to the Caltha leptosepala - Trollius albiflorus vegetation type of Banff/Jasper.

9. Carex aquatilis - Carex rostrata (Sedge)

This type is reported for both Wilderness areas in hygric areas.

Of the five stands sampled, Carex aquatilis had an average cover of 30% and Carex rostrata 12%. (C. rostrata was not consistently present.) Other important species include Betula spp., Deschampsia caespitosa, Pedicularis groenlandicum, Polygonum viviparum and Salix barrattiana.

This type is very similar to the Carex aquatilis - Carex rostrata vegetation type of Banff/Jasper.

CLOSED FOREST

VEGETATION STAND TABLE

NATURAL AREAS PROGRAM--ALBERTA ENERGY AND NATURAL RESOURCES RUN ON MON FEB 21/83 10:50:07

THIS TABLE CONTAINS 123 SPECIES IN 17 PLOTS

	1		2			3				4	5		6	7		8	
VEGETATION PLOT NUMBER	PM81 013	LA81 211	PM81 010	LA81 204	LA81 210	PL81 045	PL81 046	PM81 014	LA81 212	PL81 047	LA81 207	LA81 208	PM81 027	PM81 011	LA81 213	PL81 048	PL81 049
LAYER NUMBER 1: TREE CANOPY I			3 SPECIES														
Abies lasiocarpa	--	--	--	.5	--	11	--	--	21	--	--	--	03	--	11	--	--
Picea engelmannii	.5	11	21	21	21	21	21	38	21	21	.5	.5	11	38	11	21	11
Pinus contorta	63	63	11	.5	03	--	--	--	--	21	11	11	--	--	--	--	--
LAYER NUMBER 2: TREE CANOPY II			2 SPECIES														
VEGETATION PLOT NUMBER	PM81 013	LA81 211	PM81 010	LA81 204	LA81 210	PL81 045	PL81 046	PM81 014	LA81 212	PL81 047	LA81 207	LA81 208	PM81 027	PM81 011	LA81 213	PL81 048	PL81 049
Abies lasiocarpa	--	--	.5	--	--	--	.5	.5	--	--	--	--	--	03	--	11	02
Pinus contorta	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
LAYER NUMBER 3: SHRUB CANOPY I			4 SPECIES														
VEGETATION PLOT NUMBER	PM81 013	LA81 211	PM81 010	LA81 204	LA81 210	PL81 045	PL81 046	PM81 014	LA81 212	PL81 047	LA81 207	LA81 208	PM81 027	PM81 011	LA81 213	PL81 048	PL81 049
Abies lasiocarpa	--	--	--	--	--	--	.5	.5	63	--	--	--	--	--	--	--	11
Picea engelmannii	--	--	--	--	--	.5	--	.5	--	--	.5	03	--	.5	--	--	--
Pinus contorta	--	.5	--	--	--	--	--	.5	--	--	.5	11	--	--	--	--	--
Salix glauca	--	--	--	--	--	.5	.5	--	--	03	--	--	--	--	--	.5	.5
LAYER NUMBER 4: SHRUB CANOPY II			10 SPECIES														
VEGETATION PLOT NUMBER	PM81 013	LA81 211	PM81 010	LA81 204	LA81 210	PL81 045	PL81 046	PM81 014	LA81 212	PL81 047	LA81 207	LA81 208	PM81 027	PM81 011	LA81 213	PL81 048	PL81 049
Abies lasiocarpa	--	--	38	.5	.5	--	--	--	--	.5	--	--	--	.5	38	--	--
Betula glandulosa	--	--	--	03	--	--	--	.5	--	.5	.5	--	--	--	--	--	--
Picea engelmannii	.5	.5	11	.5	.5	--	--	--	--	--	--	--	--	--	03	--	--
Pinus contorta	.5	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Potentilla fruticosa	--	--	--	--	--	--	.5	--	--	--	.5	--	--	--	--	--	--
Salix barrattiana	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	.5
Salix farriae	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Salix glauca	.5	--	.5	--	.5	--	--	03	.5	--	11	11	.5	.5	.5	--	--
Salix vestita	--	--	.5	03	--	--	.5	.5	--	--	--	03	--	--	--	--	--
Shepherdia canadensis	11	--	--	--	--	.5	--	--	--	--	--	03	03	--	--	--	--

LAYER NUMBER 5: HERB-DWARF SHRUB 94 SPECIES

VEGETATION PLOT NUMBER	PM81 013	LA81 211	PM81 010	LA81 204	LA81 210	PL81 045	PL81 046	PM81 014	LA81 212	PL81 047	LA81 207	LA81 208	PM81 027	PM81 011	LA81 213	PL81 048	PL81 049
Abies lasiocarpa	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--
Achillea millefolium	--	.5	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Agoseris glauca	--	.5	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Agropyron latiglume	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--
Anemone multifida	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Anemone parviflora	.5	--	.5	.5	.5	--	--	--	--	--	--	.5	--	--	--	--	.5
Antennaria neglecta	--	--	--	--	.5	--	--	--	--	--	--	.5	--	--	--	--	--
Antennaria racemosa	--	--	.5	.5	--	--	--	--	--	--	--	--	.5	--	--	--	--
Antennaria rosea	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--
Aquilegia flavescens	--	--	--	--	--	--	.5	--	--	--	--	--	.5	--	--	--	--
Arctostaphylos rubra	.5	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	.5	--
Arctostaphylos uva-ursi	10	11	.5	--	--	.5	--	--	--	.5	.5	03	--	--	--	--	--
Arnica cordifolia	--	.5	.5	.5	--	03	.5	.5	.5	03	--	03	03	--	.5	.5	--
Aster alpinus	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--
Aster conspicuus	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Astragalus alpinus	.5	--	--	.5	--	--	.5	--	--	--	.5	.5	--	--	.5	--	--
Astragalus frigidus	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Astragalus occidentalis	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--
Bromus pumpellianus	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Calamagrostis purpurascens	--	03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Campanula rotundifolia	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carex atrosquama	--	--	--	.5	--	--	--	--	--	--	--	.5	--	--	--	--	--
Carex concinna	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carex richardsonii	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carex vaginata	--	.5	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Cassiope tetragona	--	--	03	.5	--	.5	--	03	--	--	--	11	--	--	--	11	21
Castilleja miniata	.5	--	--	--	--	--	.5	--	--	.5	--	--	--	--	--	--	--
Castilleja occidentalis	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5
Castilleja raupii	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Cornus canadensis	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	.5	--
Danthonia intermedia	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Draba nivalis	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Draba praealta	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--
Dryas drummondii	--	--	--	.5	--	--	--	--	--	--	--	.5	--	--	--	--	--
Dryas octopetala	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5
Elymus innovatus	38	.5	.5	--	03	.5	03	.5	--	11	21	21	--	--	.5	--	--
Empetrum nigrum	--	--	21	21	21	03	--	--	--	--	--	--	--	.5	--	--	--
Epilobium angustifolium	.5	--	--	--	--	--	--	--	.5	--	.5	03	.5	.5	--	--	--
Equisetum arvense	--	--	--	--	--	--	--	--	--	--	--	--	38	--	--	--	--
Equisetum scirpoides	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	.5	--
Equisetum variegatum	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--
Erigeron ochroleucus	--	--	--	--	--	--	--	--	03	--	--	--	--	--	--	--	--
Erigeron peregrinus	.5	--	.5	.5	--	--	.5	--	.5	--	--	.5	03	--	--	--	.5
Festuca brachyphylla	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Festuca saximontana	--	--	--	--	--	--	--	--	.5	--	.5	.5	--	--	--	--	--
Fragaria virginiana	--	--	--	--	--	--	.5	--	--	--	.5	--	--	--	--	--	--
Gentiana amarella	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gentiana propinqua	--	--	.5	.5	--	--	--	--	--	--	.5	.5	--	--	--	--	--
Hedysarum alpinum	11	--	--	--	.5	--	--	--	--	--	--	.5	--	--	--	--	--
Hieracium gracile	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Juniperus communis	21	21	.5	--	--	.5	.5	--	03	03	.5	--	--	--	--	--	--
Juniperus horizontalis	--	--	--	--	--	--	--	--	--	--	--	03	--	--	--	--	--
Ledum groenlandicum	--	--	.5	.5	--	.5	.5	.5	--	--	--	--	--	--	--	.5	.5

Linnaea borealis	03	.5	.5	--	--	--	.5	--	--	03	--	--	--	.5	--	--	--				
Luzula wahlenbergii	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Lycopodium annotinum	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Lycopodium selago	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5				
Mitella nuda	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Moneses uniflora	--	--	.5	--	--	--	--	.5	--	--	--	.5	.5	.5	--	.5	--				
Oxyria digyna	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5				
Parnassia fimbriata	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Parnassia sp.	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--				
Pedicularis bracteosa	--	--	.5	.5	.5	--	03	.5	--	.5	--	.5	.5	--	--	--	.5				
Petasites palmatus	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--				
Petasites vitifolius	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Phyllodoce glanduliflora	--	--	21	.5	38	.5	03	38	03	--	--	--	--	--	--	.5	38				
Picea engelmannii	--	--	--	--	--	--	--	--	.5	--	--	--	11	--	--	--	--				
Poa alpina	--	--	--	.5	--	--	--	--	--	--	--	03	--	--	--	--	.5				
Poa arctica	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--				
Poa nervosa	--	--	--	--	--	--	--	--	--	--	--	03	--	.5	--	--	--				
Polygonum viviparum	--	--	--	.5	--	--	.5	--	--	--	--	.5	--	--	--	--	.5				
Potentilla diversifolia	--	--	--	--	.5	--	.5	--	--	--	.5	--	--	--	--	--	--				
Potentilla fruticosa	--	.5	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--				
Pyrola asarifolia	--	--	--	--	--	--	.5	--	--	.5	.5	--	--	--	--	--	--				
Pyrola minor	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Pyrola secunda	.5	.5	--	.5	--	--	--	.5	--	--	--	--	--	.5	--	--	--				
Rhododendron albiflorum	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--				
Ribes lacustre	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--				
Rosa acicularis	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
Rubus acaulis	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
Salix glauca	--	--	--	11	--	--	--	--	--	--	--	--	--	--	--	--	--				
Salix vestita	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--				
Saxifraga lyallii	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--				
Senecio cymbalarioides	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
Senecio lugens	--	--	--	--	--	--	--	--	--	--	--	--	03	--	--	--	--				
Silene acaulis	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5				
Solidago multiradiata	.5	.5	.5	.5	.5	--	--	--	.5	--	.5	.5	03	--	.5	.5	.5				
Stellaria longipes	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--				
Trisetum spicatum	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--				
Vaccinium caespitosum	--	--	.5	--	--	--	--	--	--	--	03	--	--	--	--	--	--				
Vaccinium myrtillus	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--				
Vaccinium scoparium	.5	--	.5	03	03	21	11	21	11	.5	--	03	--	.5	.5	.5	.5				
Vaccinium vitis-idaea	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--				
Zygadenus elegans	11	.5	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--	--				

LAYER NUMBER 6: BRYOID 22 SPECIES

VEGETATION PLOT NUMBER	PM81 013	LA81 211	PM81 010	LA81 204	LA81 210	PL81 045	PL81 046	PM81 014	LA81 212	PL81 047	LA81 207	LA81 208	PM81 027	PM81 011	LA81 213	PL81 048	PL81 049
Aulacomnium palustre	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barbilophozia sp.	--	--	--	--	--	--	--	.5	--	--	--	--	--	.5	--	--	--
Cetraria sp.	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Cladonia chlorophaea	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cladonia mitis	--	--	11	--	--	--	--	.5	--	--	--	--	--	.5	.5	--	--
Cladonia sp.	.5	--	--	--	--	--	--	03	--	--	--	--	--	--	.5	--	--
Dicranum fuscescens	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dicranum scoparium	--	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	--
Dicranum sp.	--	--	--	--	--	--	--	11	--	--	--	--	--	.5	--	--	--
Hylocomium splendens	--	--	03	38	--	--	--	63	63	--	--	05	--	63	21	--	.5
Icmadophila ericitorum	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Letharia vulpina	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Lophozia sp.	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Peltigera aphthosa	.5	--	03	--	--	--	--	11	--	--	--	--	--	11	03	--	--
Peltigera sp.	.5	--	--	--	--	--	--	03	--	--	--	--	--	--	--	--	--
Pleurozium schreberi	--	--	.5	01	--	--	38	38	--	--	--	--	--	21	--	38	--
Polytrichum juniperinum	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Polytrichum sp.	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ptilium crista-castrensis	--	--	--	--	--	--	--	--	--	--	--	--	--	03	--	--	--
Splachnum sp.	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stereocaulon sp.	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Tetraplodon mnioides var. cavifo	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--

OPEN FOREST

VEGETATION STAND TABLE

NATURAL AREAS PROGRAM--ALBERTA ENERGY AND NATURAL RESOURCES RUN ON TUE FEB 15/83 16:18:01

THIS TABLE CONTAINS 98 SPECIES IN 10 PLOTS

	1	2			3				4	5
VEGETATION PLOT NUMBER	PL81 056	PL81 057	PM81 017	LA81 209	PM81 026	PL81 058	PM81 016	LA81 215	PL81 059	PL81 060
LAYER NUMBER 1: TREE CANOPY I										
Abies lasiocarpa	--	03	--	--	08	21	11	11	11	03
Picea engelmannii	11	11	21	.5	--	03	--	21	--	11
LAYER NUMBER 2: TREE CANOPY II										
VEGETATION PLOT NUMBER	PL81 056	PL81 057	PM81 017	LA81 209	PM81 026	PL81 058	PM81 016	LA81 215	PL81 059	PL81 060
Abies lasiocarpa	--	--	.5	--	--	--	--	--	--	--
Picea engelmannii	--	--	03	--	--	--	--	--	--	--
LAYER NUMBER 3: SHRUB CANOPY I										
VEGETATION PLOT NUMBER	PL81 056	PL81 057	PM81 017	LA81 209	PM81 026	PL81 058	PM81 016	LA81 215	PL81 059	PL81 060
Salix glauca	21	--	--	--	--	--	--	--	--	--
LAYER NUMBER 4: SHRUB CANOPY II										
VEGETATION PLOT NUMBER	PL81 056	PL81 057	PM81 017	LA81 209	PM81 026	PL81 058	PM81 016	LA81 215	PL81 059	PL81 060
Abies lasiocarpa	--	--	--	--	--	--	--	11	--	03
Betula glandulosa	--	.5	--	.5	--	--	--	--	--	03
Picea engelmannii	--	--	--	03	--	--	--	.5	--	--
Salix barrattiana	--	--	.5	--	--	--	.5	--	--	--
Salix drummondiana	--	21	38	11	--	--	--	--	--	--
Salix farriae	--	--	11	--	--	--	--	--	--	--
Salix glauca	--	--	03	.5	--	.5	--	--	.5	--
Salix vestita	.5	21	5	--	--	--	--	--	.5	21
Shepherdia canadensis	11	--	11	.5	--	--	--	--	--	--

LAYER NUMBER 5: HERB-DWARF SHRUB 82 SPECIES

VEGETATION PLOT NUMBER	PL81 056	PL81 057	PM81 017	LA81 209	PM81 026	PL81 058	PM81 016	LA81 215	PL81 059	PL81 060
Abies lasiocarpa	--	--	--	--	38	--	--	--	--	--
Agropyron latiglume	--	.5	--	--	--	--	--	--	--	--
Androsace chamaejasme	.5	--	.5	--	--	--	--	--	--	--
Anemone multifida	--	--	--	--	.5	--	--	--	--	--
Anemone parviflora	.5	.5	.5	--	--	--	.5	.5	.5	.5
Antennaria lanata	--	--	--	11	.5	.5	.5	--	--	--
Antennaria nitida	--	--	.5	--	--	--	--	--	--	--
Antennaria racemosa	--	.5	--	--	--	--	--	--	--	--
Aquilegia flavescens	--	--	.5	--	--	--	--	--	--	--
Arctostaphylos rubra	--	.5	.5	.5	--	--	--	--	--	11
Arctostaphylos uva-ursi	03	--	.5	.5	--	--	--	--	--	--
Arnica cordifolia	--	--	.5	--	.5	--	.5	--	.5	--
Arnica diversifolia	--	--	--	--	--	--	.5	--	--	--
Arnica latifolia	--	--	--	--	--	.5	--	--	--	--
Artemisia norvegica	--	--	--	--	--	--	.5	--	--	--
Astragalus alpinus	.5	--	.5	--	--	--	--	--	--	--
Astragalus occidentalis	--	--	.5	.5	--	--	--	--	--	--
Bromus pumpellianus	--	--	--	.5	--	--	--	--	--	--
Carex atrosquama	--	--	--	--	--	--	--	.5	--	--
Carex aurea	--	.5	--	.5	--	--	--	--	--	--
Carex capillaris	--	.5	--	.5	--	--	--	--	--	.5
Carex garberi	--	.5	--	--	--	--	--	--	--	--
Carex scirpoidea	--	.5	--	--	--	--	--	--	--	--
Cassiope tetragona	.5	.5	--	--	21	.5	21	11	.5	--
Castilleja miniata	--	--	.5	--	--	--	--	--	--	--
Castilleja occidentalis	--	.5	--	--	--	--	--	--	--	--
Castilleja rhexifolia	.5	--	--	--	.5	.5	--	--	--	--
Castilleja sp.	--	--	--	.5	--	--	--	--	--	--
Deschampsia caespitosa	--	.5	--	--	--	--	--	--	--	--
Dryas octopetala	03	.5	.5	--	.5	--	--	--	--	--
Elymus innovatus	11	.5	.5	--	--	--	--	--	--	--
Epilobium angustifolium	.5	--	--	--	--	--	--	--	--	--
Equisetum scirpoides	.5	.5	.5	.5	--	--	--	--	--	--
Equisetum variegatum	--	.5	--	--	--	--	--	--	--	--
Erigeron acris	--	.5	--	--	--	--	--	--	--	--
Erigeron aureus	--	--	--	--	.5	--	.5	--	--	--
Erigeron humilus	--	.5	--	--	--	--	--	--	--	--
Erigeron peregrinus	.5	.5	--	--	03	.5	--	--	03	--
Fragaria virginiana	--	--	.5	.5	--	--	--	--	--	--
Gentiana glauca	--	--	--	--	--	--	.5	--	--	--
Gentiana propinqua	.5	.5	.5	.5	--	--	--	--	--	--
Hedysarum alpinum	.5	.5	.5	03	--	--	--	--	--	--
Juniperus communis	.5	--	.5	.5	.5	--	--	--	.5	--
Linnaea borealis	.5	--	--	--	--	--	--	--	--	--
Luzula parviflora	.5	--	--	--	--	.5	--	--	--	--
Luzula wahlenbergii	--	--	--	--	--	--	.5	--	--	--
Lycopodium annotinum	--	--	--	--	--	--	--	--	.5	--
Moneses uniflora	--	.5	--	--	--	--	--	.5	--	--
Oxytropis campestris	--	--	--	.5	--	--	--	--	--	--
Parnassia fimbriata	--	--	--	--	--	--	.5	--	.5	--
Pedicularis bracteosa	.5	.5	.5	--	03	.5	--	.5	--	.5
Petasites vitifolius	--	.5	--	--	--	--	--	--	--	--
Phyllodoce glanduliflora	--	--	--	--	38	11	63	21	.5	--

Picea engelmannii	--	--	--	--	08	--	--	--	--	--
Pinus contorta	03	--	--	--	--	--	--	--	--	--
Poa alpina	--	.5	.5	.5	--	--	.5	.5	--	--
Poa arctica	--	--	--	--	--	--	--	.5	--	--
Polygonum viviparum	--	.5	--	.5	--	--	--	--	--	--
Potentilla diversifolia	--	.5	--	--	.5	.5	.5	--	--	--
Potentilla fruticosa	.5	.5	--	--	--	--	--	--	--	--
Pyrola asarifolia	.5	.5	--	--	--	--	.5	--	--	--
Pyrola minor	--	.5	.5	--	--	--	--	--	--	--
Pyrola secunda	--	--	--	--	--	--	.5	--	--	--
Salix arctica	--	--	--	--	21	--	.5	--	--	--
Salix barrattiana	--	--	--	.5	--	--	--	--	--	--
Salix glauca	--	--	--	--	--	--	--	.5	--	--
Salix nivalis	--	--	--	--	--	--	.5	.5	--	--
Salix vestita	--	--	--	.5	--	--	--	--	--	--
Saxifraga caespitosa	--	.5	--	--	--	--	--	--	--	--
Selaginella densa	--	--	--	.5	--	--	--	--	--	--
Senecio indecorus	--	--	--	--	--	--	.5	--	--	--
Senecio lugens	.5	.5	03	--	--	--	--	--	--	--
Senecio triangularis	--	.5	--	--	--	--	.5	--	.5	--
Sibbaldia procumbens	--	--	--	--	--	--	.5	--	--	--
Silene acaulis	--	.5	--	--	--	--	--	--	--	--
Solidago multiradiata	.5	.5	.5	--	--	--	.5	.5	--	--
Taraxacum officinale	--	--	--	.5	--	--	--	--	--	--
Tofieldia pusilla	--	.5	--	.5	--	--	--	--	--	--
Trollius albiflorus	--	.5	--	--	--	--	--	--	.5	--
Vaccinium scoparium	.5	--	--	--	21	.5	03	.5	03	--
Valeriana sitchensis	--	--	--	--	--	--	--	--	11	--
Zygadenus elegans	.5	.5	.5	.5	--	--	--	--	--	.5

LAYER NUMBER 6: BRYOID — 9 SPECIES

VEGETATION PLOT NUMBER	PL81 056	PL81 057	PM81 017	LA81 209	PM81 026	PL81 058	PM81 016	LA81 215	PL81 059	PL81 060
Brachythecium groenlandicum	--	--	--	--	--	--	.5	--	--	--
Cladonia sp.	--	--	--	--	--	--	.5	--	--	--
Dicranum scoparium	--	--	--	--	--	--	38	--	--	--
Drepanocladus uncinatus	--	--	--	--	--	--	.5	--	--	--
Hylocomium splendens	--	--	--	--	--	--	--	.5	--	--
Lophozia sp.	--	--	--	--	--	--	.5	--	--	--
Nephrom arcticum	--	--	--	--	--	--	.5	--	--	--
Peltigera aphthosa	--	--	--	--	--	--	11	--	--	--
Peltigera sp.	--	--	--	--	--	--	11	--	--	--

SHRUB

VEGETATION STAND TABLE

NATURAL AREAS PROGRAM--ALBERTA ENERGY AND NATURAL RESOURCES RUN ON TUE FEB 15/83 16:17:47

THIS TABLE CONTAINS 185 SPECIES IN 22 PLOTS

	1			2	3	4	5	6							7							
VEGETATION PLOT NUMBER	PM81 001	PM81 002	PM81 003	LA81 214	PL81 071	LA81 203	PM81 004	PM81 005	PM81 028	PM81 006	PL81 068	PL81 069	PL81 070	LA81 226	LA81 201	LA81 202	LA81 206	PM81 007	PM81 008	PM81 009	PM81 015	PM81 029
LAYER NUMBER 1: TREE CANOPY I			3	SPECIES																		
Abies lasiocarpa	--	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--
Picea engelmannii	--	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--
Pinus contorta	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--
LAYER NUMBER 3: SHRUB CANOPY I			2	SPECIES																		
VEGETATION PLOT NUMBER	PM81 001	PM81 002	PM81 003	LA81 214	PL81 071	LA81 203	PM81 004	PM81 005	PM81 028	PM81 006	PL81 068	PL81 069	PL81 070	LA81 226	LA81 201	LA81 202	LA81 206	PM81 007	PM81 008	PM81 009	PM81 015	PM81 029
Abies lasiocarpa	--	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pinus contorta	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LAYER NUMBER 4: SHRUB CANOPY II			12	SPECIES																		
VEGETATION PLOT NUMBER	PM81 001	PM81 002	PM81 003	LA81 214	PL81 071	LA81 203	PM81 004	PM81 005	PM81 028	PM81 006	PL81 068	PL81 069	PL81 070	LA81 226	LA81 201	LA81 202	LA81 206	PM81 007	PM81 008	PM81 009	PM81 015	PM81 029
Abies lasiocarpa	--	.5	--	--	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Betula glandulosa	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	11	21	11	--	--	--	--	--
Betula pumila	--	--	.5	--	--	--	38	.5	.5	--	--	--	--	--	--	--	--	21	.5	38	38	38
Picea engelmannii	--	.5	.5	.5	--	03	--	--	--	.5	--	--	--	--	.5	--	.5	.5	--	.5	.5	--
Pinus contorta	--	.5	--	--	--	--	.5	--	--	--	.5	--	--	--	.5	.5	.5	--	--	.5	.5	--
Potentilla fruticosa	--	--	--	--	--	.5	--	--	.5	--	--	--	--	--	--	11	03	21	.5	38	38	21
Salix barrattiana	--	.5	11	--	--	.5	.5	38	21	63	21	38	38	06	--	38	38	03	38	03	03	11
Salix brachycarpa	--	--	--	--	--	03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Salix drummondiana	--	--	.5	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	21	--	--	--	--
Salix farriae	--	--	63	--	--	--	--	--	.5	--	--	--	.5	--	--	--	--	.5	--	.5	.5	11
Salix glauca	88	63	.5	11	11	21	63	.5	--	--	.5	--	--	--	03	38	03	.5	.5	--	--	.5
Salix vestita	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--

LAYER NUMBER 6: BRYOID 29 SPECIES

VEGETATION PLOT NUMBER	PM81 001	PM81 002	PM81 003	LA81 214	PL81 071	LA81 203	PM81 004	PM81 005	PM81 028	PM81 006	PL81 068	PL81 069	PL81 070	LA81 226	LA81 201	LA81 202	LA81 206	PM81 007	PM81 008	PM81 009	PM81 015	PM81 029
Aulacomnium palustre	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	03	21	11	.5	--
Bryum pseudotriquetrum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Campylium stellatum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	03	03	--	--
Cetraria sp.	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cladonia mitis	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--
Cladonia sp.	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	.5	--	--	.5	--
Cratoneuron commutatum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	03	.5	--	--	--
Dicranum brevifolium var. bistra	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dicranum sp.	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	03	--	--	38	--
Dicranum undulatum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Drepanocladus revolvens	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20	--	.5	--	--
Drepanocladus sendtneri	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	03	--	--	--
Drepanocladus uncinatus	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20	--	--	--	--
Hylocomium splendens	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--
Hypnum sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Paludella squarrosa	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--
Parmeliopsis sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--
Peltigera aphthosa	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	.5	--	--
Peltigera canina	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Peltigera sp.	--	03	.5	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	.5	--	.5	--
Polytrichum juniperinum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Polytrichum sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--
Polytrichum strictum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Riccardia sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	.5	--	--
Sphagnum warnstorfii	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--
Stereocaulon sp.	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thamnolia sp.	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tomenthypnum nitens	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	38	63	88	38	--
Tortula ruralis	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOW SHRUB-HERB

VEGETATION STAND TABLE

NATURAL AREAS PROGRAM--ALBERTA ENERGY AND NATURAL RESOURCES RUN ON TUE FEB 15/83 16:18:06

THIS TABLE CONTAINS 118 SPECIES IN 13 PLOTS

	1		2		3								4
VEGETATION PLOT NUMBER	PM81 030	PL81 050	PM81 023	PM81 031	PM81 024	PM81 025	PL81 051	PL81 052	PL81 053	PL81 054	PL81 055	LA81 221	PL81 072
LAYER NUMBER 4: SHRUB CANOPY II			4 SPECIES										
Abies lasiocarpa	--	11	--	--	--	--	--	--	--	--	--	--	--
Salix barrattiana	--	--	.5	--	--	--	--	--	.5	11	--	--	.5
Salix brachycarpa	--	.5	--	--	--	--	--	--	--	--	--	--	--
Salix glauca	03	11	--	--	--	--	--	--	.5	.5	03	--	--
VEGETATION PLOT NUMBER	PM81 030	PL81 050	PM81 023	PM81 031	PM81 024	PM81 025	PL81 051	PL81 052	PL81 053	PL81 054	PL81 055	LA81 221	PL81 072
Abies lasiocarpa	--	--	.5	--	--	--	--	--	--	--	--	--	--
Achillea millefolium	.5	.5	--	--	--	--	--	--	--	--	--	--	--
Androsace septentrionalis	.5	--	--	--	--	--	--	--	--	--	--	--	--
Anemone drummondii	--	.5	--	--	--	--	--	--	--	--	--	--	--
Anemone multifida	.5	--	--	--	--	--	--	--	--	--	--	--	--
Anemone parviflora	.5	--	--	--	.5	--	--	--	--	--	--	--	.5
Antennaria lanata	.5	.5	--	--	--	.5	.3	.5	38	11	03	03	03
Antennaria nitida	.5	--	--	--	--	--	--	--	--	--	--	--	--
Antennaria rosea	.5	--	--	--	--	--	--	--	--	--	--	--	--
Arctostaphylos uva-ursi	03	11	--	--	--	--	--	--	--	--	--	--	--
Arenaria obtusiloba	--	--	--	.5	--	--	--	--	--	--	--	--	--
Arnica alpina	--	.5	--	--	--	--	--	--	--	--	--	--	--
Arnica rydbergii	--	--	--	--	--	--	--	--	--	.5	--	--	--
Artemisia norvegica	--	--	--	--	--	--	--	.5	11	03	--	--	--
Aster alpinus	--	--	--	--	--	--	.5	--	--	.5	--	--	--
Astragalus alpinus	.5	.5	03	.5	--	--	--	--	--	--	--	--	--
Astragalus occidentalis	.5	--	--	--	--	--	--	--	--	--	--	--	--
Calamagrostis purpurascens	--	.5	--	--	--	--	--	--	--	--	--	--	--
Caltha leptosepala	--	--	--	--	--	--	--	--	--	.5	--	--	--
Campanula lasiocarpa	--	--	.5	--	.5	--	--	--	--	--	.5	.5	--
Carex albo-nigra	--	--	.5	--	.5	--	--	--	--	.5	--	--	--
Carex capillaris	--	--	--	--	--	.5	--	--	--	--	--	--	--
Carex nigricans	--	--	--	--	--	--	--	--	--	--	--	.5	--
Carex phaeocephala	.5	--	--	--	--	--	--	--	--	--	--	--	--
Carex pyrenaica	--	--	--	--	--	.5	--	--	--	--	--	--	--
Carex raynoldsii	--	--	--	--	--	--	--	--	--	--	--	--	.5
Carex scirpoidea	--	.5	.5	--	--	--	--	--	--	--	.5	--	--
Cassiope mertensiana	--	--	--	--	--	--	--	--	--	--	--	--	21
Cassiope tetragona	--	--	38	21	03	.5	--	--	--	--	.5	03	--
Castilleja occidentalis	--	--	--	--	.5	.5	.5	.5	.5	.5	--	03	.5
Castilleja rhexifolia	--	--	.5	--	--	.5	--	.5	--	.5	--	--	.5
Cerastium arvense	--	--	.5	.5	--	--	--	--	--	--	--	--	--
Danthonia intermedia	.5	--	--	--	--	--	--	--	--	--	--	--	--
Draba nivalis	--	--	.5	--	--	--	--	--	--	--	--	--	--
Draba paysonii	--	--	--	.5	--	--	--	--	--	--	--	--	--
Dryas integrifolia	--	--	--	38	--	--	--	--	--	--	--	--	--
Dryas octopetala	--	.5	21	--	03	--	--	.5	--	--	21	63	.5
Elymus innovatus	.5	--	--	--	--	--	--	--	--	--	--	--	--
Epilobium angustifolium	5	.5	--	--	--	--	--	--	--	--	--	--	--
Equisetum variegatum	--	--	--	--	--	--	--	--	--	--	--	--	5
Erigeron acris	5	--	.5	--	--	--	--	--	--	--	--	--	--
Erigeron aureus	5	--	5	.5	5	--	--	-	--	--	--	03	--
Erigeron compositus	5	--		--		--	--	-	--	--	--	--	--

Erigeron humilus	--	--	.5	--	--	--	--	--	--	--	--	--	--		
Erigeron peregrinus	.5	--	--	--	.5	--	.5	--	.5	.5	--	--	.5		
Eriogonum subalpinum	--	.5	--	--	--	--	--	--	--	--	--	--	--		
Festuca brachyphylla	--	.5	--	--	.5	--	--	--	--	--	--	.5	--		
Festuca saximontana	.5	--	--	--	--	--	--	--	--	--	--	--	--		
Fragaria virginiana	03	.5	.5	.5	--	--	--	--	--	--	--	--	--		
Gentiana glauca	--	--	--	--	--	.5	--	--	--	--	--	--	--		
Gentiana propinqua	.5	.5	.5	--	--	--	--	--	--	--	--	--	--		
Haplopappus lyallii	--	.5	.5	.5	.5	--	.5	.5	.5	.5	.5	--	--		
Hieracium gracile	.5	--	--	--	.5	--	--	--	--	--	--	--	--		
Hierochloe alpina	--	--	--	--	--	--	--	--	--	--	.5	--	--		
Juniperus communis	--	03	--	--	--	--	--	--	--	--	--	--	--		
Kobresia myosuroides	.5	--	--	--	--	--	--	--	--	--	--	--	--		
Luzula glabrata	--	--	--	--	--	.5	--	--	--	--	--	--	--		
Luzula parviflora	--	--	--	--	--	--	.5	--	--	--	--	--	--		
Luzula spicata	--	--	--	--	--	--	--	.5	--	.5	--	.5	--		
Lycopodium alpinum	--	--	--	--	--	11	--	--	--	--	--	--	--		
Myosotis alpestris	.5	--	--	--	--	--	--	--	--	--	--	--	--		
Oxytropis podocarpa	--	--	--	.5	--	--	--	--	--	--	--	--	--		
Parnassia fimbriata	--	--	--	--	--	--	--	--	--	--	--	--	.5		
Pedicularis arctica	--	--	5	.5	--	--	.5	.5	--	--	--	--	--		
Pedicularis bracteosa	--	--	--	--	--	--	--	--	--	--	--	--	.5		
Pedicularis flammea	--	--	--	--	--	--	--	--	--	--	--	--	--		
Pedicularis groenlandica	--	--	--	--	--	--	--	--	--	--	--	--	.5		
Penstemon procerus .	.5	--	--	--	--	--	--	--	--	--	--	--	--		
Petasites vitifolius	--	--	--	--	--.	--	--	--	--	--	--	--	.5		
Phacelia sericea	--	--	--	.5	--	--	--	--	--	--	--	--	--		
Phleum alpinum	--	--	--	--	--	.5	--	--	--	--	--	--	--		
Phyllodoce glanduliflora	.5	--	.5	--	63	88	38	03	11	38	21	63	38		
Phyllodoce intermedia	--	--	--	--	--	.5	--	--	--	--	--	--	.5		
Picea engelmannii	--	--	.5	--	--	--	--	--	--	--	--	--	--		
Poa alpina	--	--	--	--	03	.5	--	.5	--	--	.5	--	.5		
Poa arctica	--	--	.5	.5	--	--	--	--	--	--	--	--	--		
Poa interior	.5	--	--	--	--	--	--	--	--	--	--	.5	--		
Poa sp.	--	--	--	--	--	--	--	--	--	--	--	--	--		
Polygonum viviparum	--	--	.5	.5	.5	--	--	--	--	.5	.5	.5	.5		
Potentilla diversifolia	--	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5		
Potentilla hyparctica	--	--	.5	.5	--	--	--	--	--	--	--	--	--		
Potentilla pensylvanica	.5	--	--	--	--	--	--	--	--	--	--	--	--		
Ranunculus eschscholtzii	--	--	.5	--	--	--	--	--	--	--	--	--	.5		
Rumex alpestris	--	--	--	--	--	--	--	--	--	.5	--	--	--		
Salix arctica	--	--	.5	.5	.5	21	11	03	03	.5	--	--	03		
Salix nivalis	.5	--	63	11	38	11	03	38	--	.5	11	11	03		
Saussurea densa	--	--	--	.5	--	--	--	--	--	--	--	--	--		
Saxifraga adscendens	--	--	--	.5	--	--	--	--	--	--	--	--	--		
Saxifraga bronchialis	--	.5	--	--	--	--	--	--	--	--	--	.5	--		
Saxifraga cernua	--	--	--	.5	--	--	--	--	--	--	--	--	--		
Saxifraga lyallii	--	.5	--	--	--	--	--	--	--	--	--	--	--		
Sedum stenopetalum	--	.5	--	--	--	--	--	--	--	--	--	--	--		
Senecio indecorus	.5	--	--	--	--	--	--	--	.5	--	--	--	--		
Senecio triangularis	--	--	--	--	--	--	--	--	--	.5	--	--	--		
Sibbaldia procumbens	--	--	.5	--	.5	.5	.5	--	.5	--	--	--	.5		
Silene acaulis	--	--	03	.5	.5	--	--	--	--	--	--	.5	--		
Solidago multiradiata	--	.5	.5	--	--	--	--	--	--	--	--	--	--		
Stellaria longipes	--	--	--	--	--	--	--	.5	--	--	--	--	--		
Stellaria monantha	.5	--	.5	--	--	--	--	--	--	--	--	--	--		
Trisetum spicatum	.5	--	--	--	.5	--	--	--	--	--	--	.5	--		
Trollius albiflorus	--	--	--	--	--	--	--	--	--	.5	--	--	11		
Veronica alpina	.5	--	.	--	5	.5	.5	--	.5	.5	--	--	5		

LAYER NUMBER 6: BRYOID 13 SPECIES

VEGETATION PLOT NUMBER	PM81 030	PL81 050	PM81 023	PM81 031	PM81 024	PM81 025	PL81 051	PL81 052	PL81 053	PL81 054	PL81 055	LA81 221	PL81 072
Blepharostoma trichophyllum	--	--	.5	--	--	--	--	--	--	--	--	--	--
Cetraria sp.	--	--	.5	--	.5	--	--	--	--	--	--	--	--
Dicranum scoparium	--	--	03	--	--	--	--	--	--	--	--	--	--
Drepanocladus uncinatus	--	--	.5	--	--	--	--	--	--	--	--	--	--
Hylocomium splendens	--	--	.5	--	--	--	--	--	--	--	--	--	--
Hypnum sp.	--	--	03	--	--	--	--	--	--	--	--	--	--
Peltigera aphthosa	--	--	.5	--	11	--	--	--	--	--	--	--	--
Pohlia nutans	--	--	--	--	.5	--	--	--	--	--	--	--	--
Psoroma hypnorum	--	--	--	--	.5	--	--	--	--	--	--	--	--
Stereocaulon sp.	--	--	--	--	.5	--	--	--	--	--	--	--	--
Thamnolia sp.	--	--	.5	--	--	--	--	--	--	--	--	--	--
Thuidium sp	--	--	03	--	--	--	--	--	--	--	--	--	--
Tortula ruralis	--	--	03	--	--	--	--	--	--	--	--	--	--

HERB-DWARF SHRUB

VEGETATION STAND TABLE

NATURAL AREAS PROGRAM--ALBERTA ENERGY AND NATURAL RESOURCES RUN ON TUE FEB 15/83 16:17:56 PART 1 OF 1

THIS TABLE CONTAINS 173 SPECIES IN 19 PLOTS

	1		2				3		4	6			7		9					
VEGETATION PLOT NUMBER	PL81 061	LA81 225	PM81 018	PM81 019	PL81 062	PL81 063	PM81 020	PM81 021	PM81 022	LA81 223	LA81 205	LA81 200	LA81 220	PL81 065	PL81 066	PL81 067	LA81 227	LA81 228	LA81 229	
LAYER NUMBER 1: TREE CANOPY I			2 SPECIES																	
Abies lasiocarpa	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	
Picea engelmannii	--	--	--	--	--	--	--	03	--	--	--	--	--	--	--	--	--	--	--	
LAYER NUMBER 3: SHRUB CANOPY I			1 SPECIES																	
VEGETATION PLOT NUMBER	PL81 061	LA81 225	PM81 018	PM81 019	PL81 062	PL81 063	PM81 020	PM81 021	PM81 022	LA81 223	LA81 205	LA81 200	LA81 220	PL81 065	PL81 066	PL81 067	LA81 227	LA81 228	LA81 229	
Pinus contorta	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	
LAYER NUMBER 4: SHRUB CANOPY II			10 SPECIES																	
VEGETATION PLOT NUMBER	PL81 061	LA81 225	PM81 018	PM81 019	PL81 062	PL81 063	PM81 020	PM81 021	PM81 022	LA81 223	LA81 205	LA81 200	LA81 220	PL81 065	PL81 066	PL81 067	LA81 227	LA81 228	LA81 229	
Abies lasiocarpa	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	
Betula glandulosa	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	
Picea engelmannii	--	--	--	--	--	--	--	.5	03	--	--	--	--	--	--	--	--	--	03	
Pinus contorta	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	
Salix barrattiana	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	11	02	--	11	
Salix brachycarpa	--	--	--	--	--	--	--	--	21	--	--	--	--	--	--	--	--	--	--	
Salix drummondiana	--	--	--	--	--	--	--	--	21	--	--	--	--	--	--	--	--	--	--	
Salix farriae	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	21	
Salix glauca	.5	--	--	--	--	--	.5	11	.5	--	--	--	--	--	--	--	--	--	--	
Shepherdia canadensis	--	--	--	--	--	--	--	11	--	--	--	--	--	--	--	--	--	--	--	

LAYER NUMBER 5: HERB-DWARF SHRUB 140 SPECIES RUN ON TUE FEB 15/83 16:17:56 PART 1 OF 1

VEGETATION PLOT NUMBER	PL81 061	LA81 225	PM81 018	PM81 019	PL81 062	PL81 063	PM81 020	PM81 021	PM81 022	LA81 223	LA81 205	LA81 200	LA81 220	PL81 065	PL81 066	PL81 067	LA81 227	LA81 228	LA81 229
Abies lasiocarpa	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Achillea millefolium	--	--	--	--	--	--	03	.5	--	--	--	--	--	--	--	--	--	--	--
Agropyron albicans	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Agropyron latiglume	.5	--	--	--	--	.5	--	--	--	--	.5	.5	--	--	--	--	--	--	--
Anemone drummondii	.5	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Anemone parviflora	--	--	--	--	--	--	--	--	--	--	03	.5	--	--	--	--	--	--	.5
Antennaria alpina	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Antennaria lanata	.5	--	.5	--	.5	--	--	--	--	--	21	03	--	.5	--	--	--	--	.5
Antennaria nitida	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--
Antennaria pulcherrima	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Antennaria rosea	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Arabis drummondii	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--
Arctostaphylos rubra	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Arctostaphylos uva-ursi	.5	--	--	--	--	--	.5	21	03	--	--	--	--	--	--	--	--	--	--
Arenaria obtusiloba	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Artemisia norvegica	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aster alpinus	--	.5	03	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Aster foliaceus	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Aster sibiricus	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Astragalus alpinus	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Astragalus occidentalis	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Betula glandulosa	--	--	--	--	--	--	--	--	.5	--	.5	03	--	--	--	--	.5	--	11
Botrychium lunaria	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Calamagrostis purpurascens	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Campanula lasiocarpa	.5	--	.5	--	.5	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Carex albo-nigra	--	--	.5	--	--	--	--	--	--	03	--	--	.5	.5	--	--	--	--	--
Carex aquatilis	--	--	--	--	--	--	--	--	--	--	--	--	--	--	38	38	21	38	38
Carex atrosquama	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carex capillaris	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	.5	--	--
Carex concinna	--	--	--	--	--	--	--	--	.5	--	--	--	.5	.5	--	--	--	--	--
Carex incondita	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carex nardina	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carex nigricans	--	--	--	--	--	--	--	--	--	11	11	21	63	63	--	--	--	--	--
Carex phaeocephala	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Carex rostrata	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	03	21	38	--
Carex scirpoidea	--	.5	--	.5	--	--	--	--	--	--	.5	11	.5	.5	--	--	--	--	--
Carex vaginata	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Cassiope tetragona	--	--	--	--	.5	.5	--	--	--	--	--	--	03	--	--	--	--	--	--
Castilleja miniata	--	--	--	--	.5	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Castilleja occidentalis	--	.5	--	--	.5	.5	--	--	.5	.5	--	--	.5	.5	--	--	--	--	--
Castilleja rhexifolia	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Delphinium glaucum	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Deschampsia caespitosa	--	--	--	--	--	--	--	--	--	--	.5	.5	03	.5	--	.5	.5	03	--
Draba aurea	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Draba borealis	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Draba crassifolia	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Draba incerta	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Draba nivalis	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dryas drummondii	--	--	--	--	--	--	--	--	21	--	--	--	--	--	--	--	--	--	--
Dryas octopetala	21	21	63	03	21	11	--	--	.5	03	--	--	03	--	--	--	--	--	--
Elymus innovatus	--	--	--	--	--	--	38	38	--	--	--	--	--	--	--	--	--	--	--
Epilobium angustifolium	.5	--	--	--	--	--	03	.5	--	--	--	--	--	--	--	--	--	--	--
Epilobium latifolium	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--

Epilobium palustre	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--
Equisetum arvense	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Equisetum scirpoides	--	--	--	--	--	--	--	--	.5	--	38	03	--	--	--	--	.5	--	--
Equisetum variegatum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--
Erigeron acris	--	--	--	--	--	--	.5	--	.5	--	--	.5	--	--	--	--	--	--	--
Erigeron aureus	--	.5	.5	--	--	--	--	--	--	.5	--	--	.5	.5	--	--	--	--	--
Erigeron compositus	.5	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Erigeron peregrinus	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	.5	--	03
Eriophorum angustifolium	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Festuca brachyphylla	.5	--	.5	.5	--	--	--	--	--	.5	--	--	.5	.5	--	--	--	--	--
Festuca saximontana	--	--	--	--	--	--	.5	.5	.5	--	--	--	--	--	--	--	--	--	--
Fragaria virginiana	--	--	--	--	--	--	.5	.5	--	--	.5	.5	--	--	--	--	--	--	--
Gentiana amarella	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	.5
Gentiana propinqua	--	--	--	--	--	.5	.5	.5	.5	--	--	--	--	--	--	--	--	--	--
Gentiana prostrata	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gentiana sp.	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Habenaria hyperborea	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Haplopappus lyallii	--	--	.5	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Hedysarum alpinum	--	.5	--	--	--	.5	--	--	03	--	.5	.5	--	--	--	--	--	--	--
Hedysarum mackenzii	--	.5	--	--	--	--	--	--	03	--	--	--	--	--	--	--	--	--	--
Juncus albescens	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Juncus biglumis	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Juncus drummondii	--	--	--	--	--	--	--	--	--	--	.5	.5	.5	.5	--	--	--	--	03
Juniperus communis	--	--	--	--	--	--	03	21	--	--	--	--	--	--	--	--	--	--	--
Kobresia myosuroides	21	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Kobresia simpliciuscula	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	.5	--	--
Ledum groenlandicum	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--
Luzula spicata	--	--	.5	.5	.5	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--
Luzula wahlenbergii	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--
Lycopodium annotinum	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--
Myosotis alpestris	--	.5	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oxytropis campestris	--	--	--	--	--	.5	--	--	.5	--	--	--	--	--	--	--	--	--	--
Oxytropis podocarpa	--	.5	--	--	--	.5	--	--	.5	--	--	--	--	--	--	--	--	--	--
Parnassia sp.	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Pedicularis bracteosa	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--
Pedicularis groenlandica	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	.5	.5	.5	.5	63
Petasites vitifolius	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Phyllodoce glanduliflora	--	--	--	--	.5	.5	--	.5	--	--	--	--	--	--	--	--	--	--	--
Picea engelmannii	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Poa alpina	.5	.5	--	--	.5	.5	.5	--	.5	.5	--	--	.5	.5	--	--	--	--	--
Poa interior	--	--	--	--	--	--	03	.5	--	--	--	--	--	--	--	--	--	--	--
Poa longipila	--	.5	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Poa nervosa	--	.5	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--
Polygonum viviparum	--	--	--	--	.5	.5	--	--	.5	.5	.5	.5	.5	.5	.5	--	.5	--	.5
Potentilla diversifolia	.5	--	--	--	.5	--	--	--	--	11	--	--	.5	.5	--	--	--	--	--
Potentilla fruticosa	--	--	--	--	--	--	--	--	.5	--	.5	.5	--	--	--	--	.5	--	.5
Potentilla hyparctica	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Potentilla nivea	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Primula egaliksensis	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Ranunculus eschscholtzii	--	--	--	--	--	--	--	--	--	--	--	--	03	03	--	--	--	--	--
Ranunculus pygmaeus	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Ribes lacustre	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Rubus acaulis	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--
Salix arctica	--	--	--	--	11	.5	--	--	--	--	--	--	--	--	.5	--	--	--	--
Salix barrattiana	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--
Salix farriae	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	38	--	--
Salix nivalis	--	--	11	.5	11	.5	--	--	--	63	38	38	.5	.5	.5	.5	--	--	--
Salix reticulata	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--
Saussurea densa	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Saxifraga aizoides	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--

Saxifraga bronchialis	--	--	.5	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Saxifraga caespitosa	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Saxifraga cernua	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Saxifraga oppositifolia	--	--	.5	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Saxifraga rivularis	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--
Scirpus caespitosus	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--	--
Scirpus pumilis	--	--	--	--	--	--	--	--	--	--	--	11	--	--	--	--	--	--	--	--
Sedum stenopetalum	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Selaginella densa	--	--	--	.5	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--
Senecio indecorus	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	.5
Senecio lugens	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--	--
Sibbaldia procumbens	--	--	.5	--	.5	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--
Silene acaulis	--	.5	.5	.5	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	.5
Solidago multiradiata	.5	--	.5	--	.5	.5	.5	.5	.5	--	.5	.5	--	--	--	--	--	--	--	--
Stellaria calycantha	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stellaria longipes	--	--	--	--	.5	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Stellaria monantha	--	--	.5	--	--	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--
Stellaria sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Taraxacum lyratum	--	--	.5	--	--	--	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--
Tofieldia pusilla	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--	--
Triglochin palustris	.5	.5	03	--	--	.5	03	--	.5	.5	--	.5	.5	.5	--	--	--	--	--	--
Trisetum spicatum	--	--	--	--	--	--	.5	11	--	--	--	--	--	--	--	--	--	--	--	--
Vaccinium caespitosum	--	--	--	--	--	--	.5	11	--	--	--	--	--	--	--	--	--	--	--	--
Vaccinium scoparium	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Vaccinium vitis-idaea	--	--	--	--	.5	--	.5	--	--	--	--	--	.5	.5	--	--	--	--	--	.5
Veronica alpina	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Zygadenus elegans																				

LAYER NUMBER 6: BRYOID

28 SPECIES

VEGETATION PLOT NUMBER	PL81 061	LA81 225	PM81 018	PM81 019	PL81 062	PL81 063	PM81 020	PM81 021	PM81 022	LA81 223	LA81 205	LA81 200	LA81 220	PL81 065	PL81 066	PL81 067	LA81 227	LA81 228	LA81 229
Aulacomnium palustre	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	02	03	--
Bryum pseudotriquetrum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Campylium stellatum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	03	--
Cetraria cucullata	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cetraria islandica	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cetraria nivalis	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cetraria tilesii	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cladonia sp.	--	--	--	--	--	--	.5	.5	.5	--	--	--	--	--	--	--	--	--	--
Dicranum scoparium	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dicranum sp.	--	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--
Drepanocladus revolvens	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	03	--
Drepanocladus uncinatus	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hypnum revolutum	--	--	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lophozia sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Luisierella barbula	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	03	--
Mnium sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Peltigera aphthosa	--	--	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Peltigera sp.	--	--	.5	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--
Polytrichum sp.	--	--	--	.5	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--
Rhizocarpon geographicum	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Scorpidium scorpioides	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	--	--
Solorina octospora	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stereocaulon sp.	--	--	-	--	--	--	.5	--	.5	--	--	--	--	--	--	--	--	--	--
Thamnolia sp.	--	--	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tomenthypnum nitens	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	63	11	--
Tortula ruralis	--	--	38	--	--	--	--	.5	--	--	--	--	--	--	--	--	--	--	--
Umbilicaria sp.		--		.5	--	--	--	--	--	-	--	--	--	--	--	--	--	--	--
Usnea sp.		-		.5	-	--	-	-	--										